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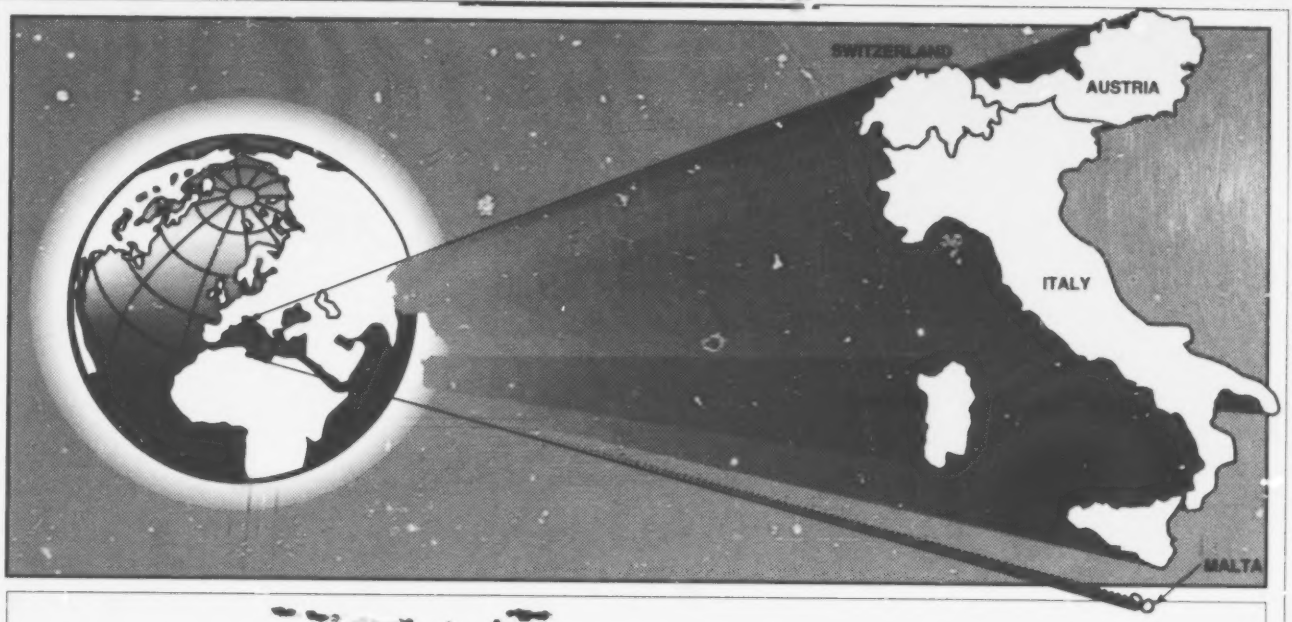


THE MINERAL INDUSTRIES OF

# SOUTHERN EUROPE

By John G. Panulas, George A. Rabchevsky,
and Richard M. Levine

## 1988

## INTERNATIONAL REVIEW

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

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THE MINERAL INDUSTRIES OF

# SOUTHERN EUROPE

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1988

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## ITALY[1]

Italy's mining activities accounted for an estimated 4% of the country's 1988 gross national product (GNP) of about $467 billion. Italy continued to be a major producer of the world's pumice (50%), feldspar (22%), cement (4%), asbestos (3%), bentonite (3%), fluorspar (3%), and magnesite (2%).

The mining and processing sectors comprised both Government-owned and private-sector enterprises. The state entities included petroleum producer Ente Nazionale Idrocaruri (ENI) and its affiliates Societa per Azioni Minero-Metallurgiche (SAMIM) and Azienda Generali Italiana Petroli-Minière S.p.A. (AGIP Minière); the iron and steel conglomerate Finanziaria Siderurgica S.p.A. (Finsider) and its subsidiaries Nuovo Italsider S.p.A., Dalmine S.p.A., Deltasider, and Acciaieria Piombino. The major privately owned companies of the mineral industry were Societa Mineraria e Metallurgica di Pertusola S.A. (Pertusola), which produces lead and zinc, and Acciaiere Lombarde Falck (Falck), which manufactures steel.

### Production

The Italian mining industry showed little growth in 1988. Production of metallic minerals fell slightly. Smelter and refinery production of most metals generally remained constant. Output of industrial minerals registered negligible growth. Likewise, industrial mineral products posted only small gains. In general, petroleum and natural gas sustained their previous output levels.

### Trade

The table outlines the impact of selected classes of minerals commodities on Italy's balance-of-payments position in relation to other European Community (EC) member nations and the world. The figures are for 1987, the latest year for which data were available.

### Commodity Review

*Metals.*--**Iron and Steel.**—Italy's steel consumption amounted to 25.4 million tons, the highest level since 1980. The country became a net importer of steel for the first time since 1973. Italy's steel industry was confronted with two major issues, one of which was restructuring.

The board of Italy's state-run steel group, Finsider, approved a 3-year corporate plan that restructured the group into two new companies. One company would sell or close unprofitable plants. The following were to be auctioned to the private sector: the Trieste pig iron works, Marghera section mill, the Delta Vardano merchant bar mill, two wire plants at Naples and Salerno, and a subsidiary company, Sisma, that produces nuts and bolts. The proceeds would be applied to payment of Finsider's debts.

Slated for closure were Italsider's Campi steelworks at Genoa, Deltasider's Sesto San Giovanni works at Milan and Turin, and the Terni bar mill. These closures would result in the elimination of 3.4 million tons of raw steel capacity, 1.2 million tons of hot-rolled products, and 700,000 tons of cold-rolled products.

The second company, named Ilva, consolidated Finsider's profitable operations at Taranto (flat products), Piombino (long products), Dalmine (seamless tubes), Terni (special and stainless flat products), More Ligure (cold-rolled sheets), Cornigliano (coated products), Torre Annunziata (welded tubes), and Condore (drawn bars). Ilva's work force

| Mineral Commodity | | Exports to EC | Imports from EC | Net gain or (loss) | Exports to the world | Imports from the world | Net gain or (loss) |
|---|---|---|---|---|---|---|---|
| Crude industrial minerals: | | | | | | | |
| Asbestos | value, thousands | $7,168 | $2,771 | $4,397 | $10,785 | $20,893 | $(10,108) |
| Feldspar | do. | 4,234 | 8,339 | (4,105) | 7,678 | 13,702 | (6,024) |
| Magnesite | do. | 18,953 | 18,473 | 480 | 33,402 | 34,778 | (1,376) |
| Other | do. | 98,697 | 318,972 | (220,275) | 253,288 | 686,729 | (433,441) |
| **Total** | **do.** | **129,052** | **348,555** | **(219,503)** | **305,153** | **756,102** | **(450,949)** |
| Metalliferous ores | do. | 61,370 | 623,915 | (562,545) | 87,502 | 1,545,160 | (1,457,658) |
| Nonmetallic mineral manufactures: | | | | | | | |
| Cement | do. | 4,389 | 26,739 | (22,350) | 27,936 | 40,421 | (12,485) |
| Other | do. | 2,208,705 | 1,047,016 | (1,161,689) | 4,272,597 | 1,475,453 | 2,797,144 |
| **Total** | **do.** | **2,213,094** | **1,073,755** | **1,139,339** | **4,300,533** | **1,515,874** | **2,784,659** |
| Metals: | | | | | | | |
| Iron and steel | do. | 2,095,016 | 2,864,431 | (769,415) | 4,113,985 | 4,175,435 | (61,450) |
| Nonferrous metals | do. | 682,198 | 1,581,779 | (899,581) | 1,059,032 | 2,850,662 | (1,791,630) |
| **Total** | **do.** | **2,777,214** | **4,446,210** | **(1,668,996)** | **5,173,017** | **7,026,097** | **(1,853,080)** |
| Mineral fuels | do. | 1,136,434 | 1,476,591 | (340,157) | 2,842,458 | 16,664,018 | (13,821,560) |

TABLE 1

## ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1984 | 1985 | 1986 | 1987[p] | 1988[e] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Alumina | | 607,274 | 555,319 | 618,374 | 699,635 | [2]708,158 |
| Metal: | | | | | | |
| Primary | | 230,207 | 221,055 | 242,632 | 228,230 | [2]221,644 |
| Secondary | | 283,000 | 282,000 | 301,000 | 335,000 | 335,000 |
| Antimony: | | | | | | |
| Mine output, Sb content | | 244 | 495 | 305 | e300 | [2]308 |
| Metal, total | | 1,121 | 1,039 | 715 | e700 | [2]731 |
| Bismuth metal | | 26 | 54 | 66 | e70 | [2]32 |
| Cadmium metal, smelter | | 452 | 526 | 411 | 325 | [2]705 |
| Copper: | | | | | | |
| Mine output, Cu content | | 875 | 130 | — | — | — |
| Metal, refined, all kinds | | 50,300 | 64,300 | 64,800 | e65,000 | 65,000 |
| Iron and steel: Metal: | | | | | | |
| Pig iron | thousand tons | 11,628 | 11,658 | 11,898 | 11,334 | 11,000 |
| Ferroalloys: | | | | | | |
| Blast furnace: | | | | | | |
| Ferromanganese | | 36,092 | 50,111 | 48,002 | r e40,000 | 39,000 |
| Spiegeleisen | | 935 | 1,001 | 1,151 | e1,200 | 1,200 |
| Silicon pig iron (10%–12% Si) | | 342 | 686 | 968 | e1,000 | 1,000 |
| Electric furnace: | | | | | | |
| Ferrochromium | | 49,942 | 57,654 | 55,939 | e56,000 | 87,000 |
| Ferromanganese | | 15,651 | 17,166 | 11,653 | e12,000 | 12,000 |
| Ferrosilicon | | 71,157 | 75,302 | 62,799 | e63,000 | 51,000 |
| Silicomanganese | | 72,779 | 64,858 | 66,083 | e67,000 | 69,000 |
| Silicon metal | | 22,812 | 17,812 | 18,904 | r e16,500 | 17,000 |
| Other | | 50,755 | 15,862 | 14,022 | e14,000 | 19,000 |
| **Total** | | **320,465** | **300,452** | **279,521** | **r e270,700** | **296,200** |
| Steel, crude | thousand tons | 24,061 | 23,744 | 22,882 | 22,819 | 24,000 |
| Semimanufactures: | | | | | | |
| Wire rod | do. | 2,027 | 2,256 | 2,293 | 2,368 | 2,200 |
| Sections | do. | 6,874 | 7,135 | 3,223 | 3,458 | 5,000 |
| Plates and sheets | do. | 5,836 | 5,062 | 9,748 | 9,887 | 9,000 |
| Hoop and strip | do. | 461 | 526 | 735 | 762 | 700 |
| Railway track material | do. | 234 | 280 | 264 | 281 | 250 |
| Ingots, semimanufactures, solids for tubes | do. | 948 | 1,198 | 1,073 | 1,126 | 1,100 |
| Castings and forgings | do. | 435 | 326 | 341 | 325 | 350 |
| Other | do. | 1,524 | 1,383 | 1,454 | 1,526 | 1,400 |
| **Total** | **do.** | **18,339** | **18,166** | **19,131** | **19,733** | **20,000** |

See footnotes at end of table.

TABLE 1—Continued

## ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1984 | 1985 | 1986 | 1987[p] | 1988[e] |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Lead: | | | | | | |
| Mine output, Pb content | | 20,883 | 15,622 | 11,119 | 19,284 | [2]16,503 |
| Metal, refined: | | | | | | |
| Primary | | 37,558 | 29,538 | 29,333 | 56,900 | [2]40,640 |
| Secondary | | 102,900 | 96,700 | 101,700 | 111,400 | [2]111,600 |
| Magnesium | | | | | | |
| Mine output, Mg content | | 9,300 | 9,831 | 9,046 | 9,520 | [2]6,878 |
| Metal, primary | | 7,491 | 7,863 | 12,417 | 7,173 | [2]5,436 |
| Manganese, mine output: | | | | | | |
| Gross weight | | 9,582 | 8,621 | 6,396 | [e]3,400 | [2]9,701 |
| Mn content | | 2,858 | 2,586 | 1,689 | [e]1,000 | [2]2,538 |
| Silver metal | thousand troy ounces | 1,554 | 2,301 | 1,813 | 2,668 | [2]2,929 |
| Zinc: | | | | | | |
| Mine output, Zn content | | 42,288 | 45,438 | 26,303 | 26,101 | [2]37,150 |
| Metal, primary | | 169,672 | 215,644 | 229,397 | 229,988 | [2]242,117 |
| INDUSTRIAL MINERALS | | | | | | |
| Asbestos | | 147,272 | 136,006 | 115,208 | 118,352 | [2]94,549 |
| Barite | | 107,128 | 128,356 | 114,132 | 81,643 | [2]77,061 |
| Bromine[e] | | 500 | 600 | 450 | [r]450 | 450 |
| Cement, hydraulic | thousand tons | 37,782 | 36,677 | 35,340 | 36,200 | [2]37,257 |
| Clays, crude: | | | | | | |
| Bentonite | do. | 309 | 304 | 300 | 313 | [2]301 |
| Refractory excluding kaolinitic earth | do. | 332 | 400 | 381 | 375 | [2]454 |
| Fuller's earth | do. | 30 | 30 | 31 | 40 | [2]38 |
| Kaolin | do. | 53 | 60 | 35 | 57 | [2]71 |
| Kaolinitic earth | do. | 25 | 26 | 21 | 22 | [2]19 |
| Diatomite[e] | | 28,000 | 30,000 | 27,000 | 27,000 | 28,000 |
| Feldspar | | 985,573 | 1,115,575 | 1,237,058 | 1,173,363 | [2]1,367,776 |
| Fluorspar: | | | | | | |
| Acid-grade | | 110,330 | 95,450 | 90,900 | 80,300 | [2]81,700 |
| Metallurgical-grade | | 77,931 | 56,762 | 54,536 | 56,600 | [2]58,157 |
| **Total** | | **188,261** | **152,212** | **145,436** | **136,900** | [2]139,857 |
| Gypsum | thousand tons | [r]1,004 | [r]1,281 | 1,220 | 1,233 | [2]1,300 |
| Lime, hydrated and quicklime | do. | 2,402 | 2,276 | 1,913 | 2,172 | [2]2,250 |
| Nitrogen: N content of ammonia | do. | 1,210 | 1,217 | [e]1,200 | [e]1,200 | 1,300 |
| Perlite[e] | | 80,000 | 80,000 | [r]73,000 | 70,000 | 70,000 |
| Pigments, mineral: Iron oxides, natural[e] | | 800 | 850 | 875 | 900 | 900 |
| Potash, crude salts: | | | | | | |
| Gross weight | thousand tons | 1,481 | 1,701 | 1,261 | 1,401 | [2]1,576 |
| $K_2O$ equivalent | do. | 162 | 205 | 158 | 168 | [2]197 |

See footnotes at end of table

TABLE 1—Continued

## ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1984 | 1985 | 1986 | 1987[p] | 1988[e] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Pumice and related materials: | | | | | | |
| Pumice and pumiceous lapilli | thousand tons | 903 | e750 | e700 | 725 | [2]730 |
| Pozzolan[e] | do. | [2]5,712 | 5,000 | 4,500 | 5,000 | 5,000 |
| Pyrite, all types, gross weight | do. | 443 | 690 | 761 | e770 | [2]774 |
| Salt: | | | | | | |
| Marine, crude[3] | do. | 723 | 570 | 574 | 571 | [2]680 |
| Rock and brine | do. | 3,255 | 3,176 | 3,433 | 3,500 | [2]3,691 |
| Sand and gravel:[e] | | | | | | |
| Volcanic sand | do. | [2]115 | 110 | 100 | 100 | 100 |
| Silica sand | do. | [2]4,415 | 4,400 | 4,200 | 4,300 | 4,300 |
| Other sand and gravel | do. | [2]120,694 | 122,000 | 123,000 | 122,000 | 123,000 |
| Sodium and potassium compounds: | | | | | | |
| Caustic soda | | e8,000 | e8,500 | 10,427 | 12,162 | 11,000 |
| Sodium carbonate[e] | do. | 90 | 90 | 80 | [2]85 | 85 |
| Sodium sulfate[e] | do. | 80 | 80 | 75 | 80 | 80 |
| Stone: | | | | | | |
| Dimension:[e 4] | | | | | | |
| Calcareous: | | | | | | |
| Alabaster and onyx | do. | [2]17 | 20 | 20 | 20 | 20 |
| Marble in blocks: | | | | | | |
| White | do. | [2]1,777 | 1,500 | 1,600 | 1,600 | 1,600 |
| Colored | do. | [2]1,756 | 1,800 | 1,800 | 1,800 | 1,800 |
| Schist (calcareous) | do. | [2]510 | 500 | 500 | 500 | 500 |
| Travertine | do. | [2]1,066 | 1,100 | 1,100 | 1,100 | 1,100 |
| Tufa | do. | [2]5,207 | 5,000 | 4,500 | 4,500 | 4,500 |
| Other: | | | | | | |
| Gneiss | do. | [2]319 | 300 | 300 | 300 | 300 |
| Granite | do. | [2]2,385 | 2,500 | 2,500 | 2,500 | 2,500 |
| Lava, basalt, trachyte | do. | [2]8,799 | 7,000 | 8,000 | 8,000 | 8,000 |
| Porphyry | do. | [2]1,205 | 1,200 | 1,200 | 1,200 | 1,200 |
| Sandstone | do. | [2]1,855 | 1,800 | 1,800 | 1,800 | 1,800 |
| Slate | do. | [2]124 | 120 | 120 | 120 | 120 |
| Tuff, volcanic | do. | [2]5,930 | 5,900 | 5,800 | 5,800 | 5,800 |
| Crushed and broken: | | | | | | |
| Dolomite[e] | do. | [2]887 | 900 | 850 | 850 | 850 |
| Limestone[e] | do. | [2]117,025 | 120,000 | 110,000 | 110,000 | 110,000 |
| Marl for cement | do. | 11,502 | 11,458 | 10,574 | e11,000 | 11,000 |
| Serpentine[e] | do. | [2]1,204 | 1,500 | 1,500 | 1,500 | 1,500 |
| Quartz and quartzite[e] | do. | [2]316 | 300 | 250 | 250 | 250 |
| Strontium minerals: Celestite | | — | 4,611 | 4,667 | 177 | — |

See footnotes at end of table

TABLE 1—Continued

## ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1984 | 1985 | 1986 | 1987[P] | 1988[e] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS- Continued | | | | | | |
| Sulfur: | | | | | | |
| Gross weight of ore | thousand tons | 20 | 5 | — | — | — |
| Recovered as elemental and in compounds: | | | | | | |
| Elemental from ore | do. | 8 | 1 | — | — | — |
| S content of pyrite | do. | 192 | 280 | 309 | e300 | 300 |
| Byproduct, oil refining[e] | do. | 10 | 10 | 10 | 10 | 10 |
| Byproduct, other sources[e] | do. | 190 | 190 | 175 | 180 | 180 |
| **Total** | **do.** | **400** | **481** | **494** | **e490** | **490** |
| Talc and related materials | | 142,727 | 129,614 | 151,206 | 148,028 | [2]158,722 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Asphalt and bituminous rock, natural | | 91,988 | 88,700 | 65,889 | e66,000 | [2]56,907 |
| Carbon black[e] | | 160,000 | 150,000 | 155,000 | 156,000 | 155,000 |
| Coal: | | | | | | |
| Lignite | thousand tons | 1,806 | 1,892 | 1,573 | e1,600 | 1,600 |
| Subbituminous (Sulcis coal) | | 8,112 | 18,773 | 13,708 | e13,700 | [2]48,408 |
| Coke, metallurgical | thousand tons | 6,920 | 7,377 | 7,156 | 6,751 | 7,000 |
| Gas, natural, marketed | million cubic feet | 488,650 | 503,058 | 563,735 | e564,000 | [2]587,386 |
| Natural gas liquids | thousand 42-gallon barrels | 383 | 360 | e400 | e400 | 400 |
| Petroleum: | | | | | | |
| Crude | do. | 15,635 | 16,024 | 17,230 | e17,000 | [2]32,714 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | 21,286 | 19,964 | 21,274 | 28,314 | [2]30,712 |
| Gasoline, all kinds | do. | 123,522 | 124,617 | 131,538 | 137,989 | [2]139,102 |
| Naphtha | do. | 22,876 | 27,175 | 33,932 | 18,921 | [2]15,806 |
| Jet fuel | do. | 8,664 | 9,400 | 11,336 | 11,056 | [2]14,128 |
| Kerosene | do. | 18,514 | 17,042 | 27,729 | 28,760 | [2]30,349 |
| Distillate fuel oil | do. | 171,557 | 169,499 | 203,046 | 190,946 | [2]188,685 |
| Residual fuel oil | do. | 173,466 | 146,087 | 156,916 | 156,090 | [2]156,783 |
| Other | do. | 40,957 | 43,988 | 45,150 | 46,263 | [2]49,287 |
| Refinery fuel and losses | do. | 48,631 | 36,735 | 29,407 | 37,443 | [2]45,367 |
| **Total** | **do.** | **629,473** | **594,507** | **660,328** | **655,782** | **670,219** |

[e] Estimated. [P] Preliminary. [r] Revised.

[1] Table includes data available through July 1989.

[2] Reported figure.

[3] Does not include production from Sardinia and Sicily estimated at 200,000 tons annually.

[4] Output of limestone and serpentine for dimension stone use is included with "Stone, Crushed and broken."

was reduced from 78,000 to 63,000. The labor force was to be further reduced to 50,000 before yearend. The personnel reductions and reduced capacity of the new company were expected to halve operational losses from $1.2 million[2] in 1987 to $600,000 in 1988.

A second issue concerned state aid to Italy's iron and steel industry. It was not clear if the EC would permit state aid of $5.6 million to Ilva to facilitate its restructuring effort. EC concern was that Ilva's Bagnoli operations, near Naples, would not be curtailed sufficiently. The melting shop at Bagnoli, which produced 1 million tons of hot-rolled coil annually, was scheduled for closure. The elimination of 2,500 jobs at Bagnoli caused worker protests. The Italian Government responded by postponing indefinitely any decision about closing Bagnoli, indicating that Bagnoli would remain open if it became profitable. This contradicted a December EC resolution that the first $4 million of Italian state aid would be delivered upon closure of Bagnoli's liquid steel facilities. The Italian Government indicated, however, that state aid would not be linked to the closure at Bagnoli.

Earlier in the year, the EC determined that the sustained granting of credit by publicly controlled Italian banks to Finsider was illegal, was tantamount to state aid, and did not correspond to market practice. The EC found the loans in violation of article 88 and article 4(c) of the European Coal and Steel Community Treaty that prohibits such activity.

**Lead and Zinc.**—At the Monteponi Mine, run by the Giovanni and Benedetto division of Società Italiana Minière, survey work confirming further ore deposits was completed. Most of the survey work was done 200 feet below the mine surface. The Monteponi Mine produced 350,000 tons of crude sulfides, of which 12,200 tons contained lead metal.

At the Marx and Nebida ore bodies in Sardinia, also operated by Società Italiana Minière, bore holes driven 50 feet below the mine surface revealed extensive mineralization that could be developed. Average grades were determined to be 3.31% zinc and 2.25% lead.

At SAMIM's Porto Vesme electrolytic zinc plant in Sardinia, 77,000 tons of electrolytic zinc in cathodes was produced. In addition, 35,000 tons of decoppered lead was produced. Much of the decoppered lead output was sent to SAMIM's San Garino plant for treatment. A reorganization at that plant enabled SAMIM to treat the entire decoppered lead output from Porto Vesme.

**Magnesium.**—Italian Magnesium and Magnesium Alloy Co. began to rebuild the smelting plant at the company's Dosseni Mine facility in Trento Province. Consequently, output volume at the mine was reduced to 62,500 tons of crude ore. Metal content of that ore amounted to 6,800 tons.

***Industrial Minerals.*—Asbestos.**—At Amiantifera di Balangero S.p.A.'s Balangero Mine near Turin, a new transport shaft was built and a new conveyor belt assembled that would link a secondary crusher with the primary crusher located at a newly constructed concourse 630 feet above sea level. About 89,000 tons of fiber was derived by treating the crude Balangero ore.

**Cement.**—Italy's cement industry saw numerous modifications and improvements to existing plants.

Presacementi overhauled its number 3 kiln at its Robilante plant in southern Italy. The kiln was equipped with a tertiary air precalcining and cooling system, with a view toward producing 4,000 tons per day of clinker. A kiln control system also was installed.

Cementerie Italiane del Sud S.p.A. changed its Vibo Valentia works from wet to dry process and added a raw mill.

Italcementi installed a preheater kiln capable of producing 2,000 tons per day in its Vibo Valentia plant at the southern tip of Italy. At its Sicily plant, the company installed an 1,800-ton-per-day kiln.

Colacem installed an 1,800-ton-per-day preheater kiln in its Gubio plant. Unicem installed a new, 60-ton-per-hour finish mill at Barletta, on the southeast coast of Italy.

**Dimension Stone.**—In terms of tonnage, dimension stone continued to be the most important industrial mineral produced in Italy. There were an estimated 3,000 to 4,000 dimension stone quarries throughout the country. The most significant white-marble-producing area was in the Apuan Alpo in Tuscany, near the town of Carrara. The Lombardy region, the Po Valley, Venetia, Puglia, Sicily, and Lazio were important colored-marble-producing areas. The major domestic uses of dimension stone were in the construction and monument industries. Increasingly, Italian dimension stone producers focused their work on value-added products and shaping, cutting, and polishing imported stone.

**Fluorspar.**—At Mineraria Silius's Gennas Tres Montes and Moscadroxin Mines, surveys, taken at 200 and 250 feet above sea level, indicated a significant increase in reserves.

**Pyrite.**—At New Solmine's Scarlino plant, a number of ecological programs were undertaken. These included converting catalyzers from single to double absorption, to considerably reduce sulfur emissions; replacing waste dumps and slurry ponds over 50 hectares with floral landscape; and constructing a new water-treatment plant. At Scarlino, 933,000 tons of sulfuric acid was produced, a 74,000-ton increase.

**Salt.**—At Montedipe's Tunipa del Salto Mine, four new wells were drilled. Three of the four wells were intended for "blanket" use. In blanket use, a predetermined amount of oil is introduced into the well. The oil floats on top of the brine, precluding dissolution

of the rock salt in the upper segment of the cavern.

***Mineral Fuels.*—Coal.**—At Nuraxi Figus, construction of a new washing plant began. Capacity of the new plant was estimated to be 1.7 million tons of washed coal per year. At Sulcis, work continued on assembling the main descending shaft in the facility, as well as excavating of underground roadways. The coal produced at Sulcis resulted from development work and amounted to 264,000 tons of crude output. That output was then treated at Seruci and yielded 50,000 tons of washed coal.

**Geothermal Energy.**—Deep prospecting for geologic, hydrologic, and chemical finds took place in the Larderello, Monte Amiata, and Torre Alfina regions of Italy. About 29,300 meters of boreholes was drilled in three areas. Five of the boreholes drilled at Larderello and three at Monte Amiata produced positive results, the details of which were not available.

## AUSTRIA[3]

Austria has a long mining tradition. Even though Austria has a variety of mineral resources, the country is small, and reserves have declined considerably. Base metals, coal, graphite, iron ore, magnesite, salt, and tungsten were the backbones of the mining industry. Steelmaking and production of antimony, with some lead and zinc, were the main processing industries. Austria imported many of the raw materials necessary for its domestic processing requirements. Basic refractories continued to be among the principal industrial mineral exports.

Except for brown coal mining, Austria's mining industry performed satisfactorily in 1988. Some branches were able to increase production. The mining sector's contribution to gross domestic product (GDP) declined to about $500 million,[4] from $540 million in 1987. Mining thus made up 0.4% of GDP in both real and nominal terms. Employment in mining dropped from 9,688 in 1987 to 9,000 in 1988. Of those, 4,445 were employed in mining companies belonging to State-owned industries.

Tourism was a major factor in Austria's economy. The Austrian tourist industry, one of the oldest in the world, brought in 88 million visitors in 1988. Visitors from the EC countries accounted for almost 90% of the tourists staying in Austria.

Austrian GDP rose 4.2%, after an 8-year period during which the average annual growth rate barely exceeded 1.5%. Austria outperformed all the main Western European economies. Inflation rose only slightly, to 2%. Total employment also rose for the first time since 1979, a trend expected to bring down the unemployment rate from 5.3% in 1988 to 4.9% in 1989 and 1990. In absolute terms, there were about 160,000 unemployed people in 1988. The annual average employment numbered 2,808,000 workers in 1988, a post World War II record. At yearend, more than 1 million employees worked 38 or 38.5 hours per week.

Since the nationalization laws came into being some 40 years ago, Austria has become the country with the highest proportion of publicly owned companies of all the Organization for Economic Cooperation and Development (OECD) countries. The companies of the Osterreichische Industrieholding AG (OIAG) were responsible for 20% of the country's industrial output.

Impelled by heavy losses during 1985 and 1986 in OIAG's nationalized industries including such companies as Voest-Alpine AG (VA) (steel), Austria Metall AG (nonferrous metals), Chemie Linz AG (chemicals), and Elin Union AG (electrics and electronics), the Austrian Government in 1987 and 1988 undertook major steps to improve negative fiscal performance. Parliament provided a legal basis for the operation of a holding group, providing $2.67 billion to cover the costs of the restructuring process. The Government also brought in new management, retaining a 51% stake in the State-run company while selling the remaining 49% to the public in stages.

OIAG formed 7 divisional holding companies covering 350 companies for the steel, electrics and electronics, nonferrous metals, mining, machinery and plant construction, oil and gas, and chemicals industries. Each holding company controlled the activities of the group belonging to its industry. The divisional holding companies were to direct the activities of their subsidiaries, decide on investments and key personnel, and issue general guidelines for their industries. OIAG was to direct their activities and decide on investment flows, finances, dividends, organizational structure, joint ventures, and acquisitions. The new divisional holding companies included the following: Voest-Alpine Stahl Holding AG (steel), with 30,332 employees as of April 1988; Maschinen-und Anlagenbau Osterreichische Mineralolverwaltungs Holding AG (machinery), with 15,765 employees; Osterreichische Mineralolverwaltungs AG (OMV) (oil and gas), with 9,783 employees; Elektrotechnik und Elektronik Industrie Holding AG (electronics), with 11,544 employees; Austria Metall AG (nonferrous metals), with 5,103 employees; Chemie Holding AG (chemicals), with 5,839 employees; and OIAG Bergbauholding AG, or OBAG (mining), with 5,497 employees.

In 1987, gross revenues for the OIAG group were listed as $12.36 billion, with exports recorded as $4.74 billion. The group employed 93,373 people. The 1988 restructuring involved laying off more than 20,000 workers, some 20% of the OIAG's total labor force, which was slimmed down to 88,220 people.[5] OIAG still accounted for more than 10% of Austria's GNP and almost one-fifth of Austria's exports in 1988. Minerex AG, a geological consulting company wholly owned by OIAG, ceased its activities

in March 1988, laying off all of its employees.

A separate holding company for the State-owned mining companies, OBAG, held 100% of the shares in Bleiberger Bergwerks-Union AG, Wolfsegg-Traunthaler Kohlenwerks AG, Graz-Koflacher Eisenbahn-und Bergbau GmbH, the VA's iron ore company in Erzberg, and 40% of the shares in Salzach-Kohlenbergbau-Gesellschaft mbH.

**Production**

In Austria, there were 90 operating mines and quarries, of which 21 were underground mines, 58 were surface mines, 7 were both underground and surface, and 4 were boreholes for salt solution minings. There were 9,688 workers employed by the minerals industries.

Total plant and equipment investment grew 5.3% in real terms, after rising only 1.8% a year earlier. Despite positive trends in industry, such as good profits and high capacity utilization, industrial investment stagnated in 1988. After declining 1.8% in 1987, industrial production grew a substantial 6.5% in 1988. This was the highest growth since 1979. Producers of raw materials and semifinished goods benefited from booming foreign trade throughout 1988.

Voest-Alpine Maschinenbau GmbH carried out field tests with its newly developed Voest-Alpine Surface Miner in an Austrian gypsum mine. The Miner was designed to cut medium-to-hard overburden and minerals such as anthracite, bituminous, and lignite coal; phosphate; gypsum; limestone; clay; and marl. Excavated material was loaded directly from the machine into trucks.[6]

**Trade**

Exports were of central importance to Austria's economic well-being. Austria remained a member of the European Free Trade Association and had important trade links to Eastern Europe. Austria's economy also was closely tied to the EC. About 64% of Austrian exports went to Community countries, and 70% of Austria's imports came from them. Total exports to other countries accounted for about 9%. The Federal Republic of Germany and France were Austria's two most important trading partners. Total imports rose in value by 9%.

About 40% of all goods and services produced was exported. Raw materials and energy exports showed a slight decline after a strong rise registered in the previous year. Because of its internalization process, the OIAG group accounted for 17% of Austria's exports.

Total exports grew by 9% in real terms. In 1988, exports to the EC expanded by 12.6%, to the Eastern European bloc by 13.3%, to the member states of the Organization of Petroleum Exporting Countries by 14.4%, and to the United States by 10.8%. The U.S. market accounted for 3.5% of Austria's exports.

In 1988, VA received orders from the U.S.S.R. totaling about $650 million; almost one-half of the orders were for the third expansion phase of the Zhlobin steel tire cord plant in Byelorussia.[7] VA also received orders from Poland for the installation of a vibrating pickling plant, from Bulgaria for a continuous slab caster, and from Czechoslovakia for a pipe finishing plant.

Austria's Treibacher Chemische Werke AG signed a joint-venture agreement with Greenbushes Ltd. of Australia for the production and marketing of tantalum and niobium carbide products.

**Commodity Review**

***Metals.*—Iron Ore and Steel.**—The only iron ore producer in Austria, VA, drastically cut the labor force at its mine in Erzberg. Underground operations ceased, while surface operations supplied about 25% to 30% of domestic iron ore requirements. Most of VA's iron ore was imported from the U.S.S.R., with some from Sweden and Canada, in declining order. Operating losses were reduced considerably after severe personnel cuts. A December 1988 amendment of the 1979 mining promotion act made the Erzberg Mine eligible for the mining subsidy program and secured its survival for some years at least. The mining industry subsidies, which totaled $8.54 million for 1988 and $17.1 million for 1989, were granted for exploration, to cover losses, and to close mines. The subsidies program conformed to EC regulations. The Erzberg Mine may survive until the year 2000, but its survival depends largely on the continued operation of the Donawitz steel plant utilizing its new KVA steel process. If Donawitz closes, the Erzberg Mine is unlikely to survive.

The Donawitz steel plant belonged to OIAG's Voest company. On average, the plant has lost $81.3 million annually since 1975. There were hopes that the losses could be gradually reduced by the introduction of a new steelmaking process (KVA), developed jointly with Klockner AG of the Federal Republic of Germany. The KVA steel process uses a much higher share of scrap than traditional production methods. Donawitz also reduced its labor force by 1,200, to 2,200 workers in 1988. Reportedly, an economic analysis showed that the new process and other rationalization measures are not sufficient to restore profitable performance; in any case, a Government subsidy of $219.5 million was necessary in 1988. Planners were considering closing the Donawitz works in 1991, despite the measures already taken. The works would probably have to be shut down in any case, should Austria eventually become an EC member. The decision to invest in the KVA process, therefore, seemed based on political rather than economic considerations.

Voest developed a new ironmaking technology called Corex. A 60,000-metric-ton-per-year Corex pilot plant was operating in Austria. Voest was also designing and building the first such commercial-size direct coal reduc-

TABLE 2

## AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

| Commodity | | 1984 | 1985 | 1986 | 1987[p] | 1988[p] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum metal: | | | | | | |
| Primary | | 95,833 | 94,106 | 92,453 | 93,414 | 95,494 |
| Secondary | | r21,500 | r21,100 | 24,700 | 19,800 | 29,400 |
| **Total** | | **r117,333** | **r115,206** | **117,153** | **113,214** | **124,894** |
| Antimony, mine output, Sb content of concentrate | | 523 | 477 | 514 | 322 | 228 |
| Cadmium metal | | 49 | 52 | 52 | 26 | 26 |
| Copper: | | | | | | |
| Smelter, secondary | | 24,600 | 25,900 | 25,500 | 38,700 | 38,400 |
| Refined: | | | | | | |
| Primary | | 9,592 | 8,207 | 7,067 | 3,855 | 3,551 |
| Secondary | | 34,293 | 34,966 | 32,579 | 32,924 | 38,378 |
| **Total** | | **43,885** | **43,173** | **39,646** | **36,779** | **41,929** |
| Germanium, Ge content of concentrate | kilograms | 4,800 | 5,500 | 6,300 | 6,700 | 6,000 |
| Iron and steel: | | | | | | |
| Iron ore and concentrate: | | | | | | |
| Gross weight | thousand tons | 3,600 | 3,270 | 3,120 | 3,061 | 2,301 |
| Fe content | do. | 1,138 | 1,019 | 976 | 954 | 727 |
| Metal: | | | | | | |
| Pig iron | do. | 3,745 | 3,704 | 3,349 | 3,451 | 3,665 |
| Ferroalloys, electric-furnace | do. | 13 | 12 | 12 | 12 | r2 |
| Crude steel | do. | 4,870 | 4,660 | 4,292 | 4,301 | 4,560 |
| Semimanufactures | do. | 3,842 | 3,760 | 3,462 | 3,432 | 3,752 |
| Lead: | | | | | | |
| Mine output, Pb content of concentrate | | 4,151 | r6,129 | 4,662 | 5,246 | 2,281 |
| Metal: | | | | | | |
| Smelter: | | | | | | |
| Primary | | 1,707 | 1,930 | 1,500 | 3,400 | e5,000 |
| Secondary | | 16,476 | 15,601 | 15,000 | 15,700 | e17,404 |
| **Total** | | **18,183** | **17,531** | **16,500** | **19,100** | **e22,404** |
| Refined: | | | | | | |
| Primary[e] | | 10,000 | 10,000 | 6,000 | r6,800 | 8,200 |
| Secondary | | 16,200 | 15,500 | 19,000 | 16,000 | 16,700 |
| **Total** | | **26,200** | **25,500** | **25,000** | **22,800** | **24,900** |
| Manganese, Mn content of domestic iron ore | | 67,101 | 60,074 | 58,945 | 57,486 | 40,917 |
| Tungsten, mine output, W content of concentrate | | 1,632 | 1,481 | 1,387 | 1,250 | e1,230 |
| Zinc: | | | | | | |
| Mine output, Zn content of concentrate | | 20,879 | 21,704 | 16,290 | 15,735 | 17,051 |
| Metal, refined | | 24,000 | 25,000 | 24,000 | 24,300 | 23,900 |
| INDUSTRIAL MINERALS | | | | | | |
| Cement, hydraulic | thousand tons | 4,899 | 4,560 | 4,569 | 4,522 | e4,600 |

See footnotes at end of table.

TABLE 2—Continued

## AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

| Commodity | | 1984 | 1985 | 1986 | 1987[p] | 1988[p] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Clay: | | | | | | |
| Illite | | 285,553 | 212,678 | 268,451 | 275,921 | e276,000 |
| Kaolin: | | | | | | |
| Crude | | 455,695 | 500,844 | 444,852 | 444,927 | e445,000 |
| Marketable | | 99,541 | 100,151 | 46,291 | 188,533 | e189,000 |
| Other | | 18,058 | 49,161 | 33,037 | 12,961 | e13,000 |
| Feldspar, crude | | 2,554 | 13,570 | 2,850 | 4,692 | e5,000 |
| Graphite, crude | | 43,789 | 30,764 | 36,167 | 39,391 | e39,500 |
| Gypsum and anhydrite, crude | | 740,117 | 693,993 | 701,749 | 664,452 | 721,745 |
| Lime | thousand tons | 1,262 | 1,301 | 1,275 | 1,378 | 1,545 |
| Magnesite: | | | | | | |
| Crude | do. | 1,183 | 1,255 | 1,084 | 947 | 1,122 |
| Sintered or dead-burned | do. | 377 | 389 | 315 | 345 | 360 |
| Caustic calcined | do. | 93 | 75 | 73 | 58 | 67 |
| Nitrogen: N content of ammonia[e] | do. | 500 | 500 | 450 | 450 | 450 |
| Pigments, mineral: Micaceous iron oxide | | e11,500 | 11,583 | 11,730 | 10,807 | 9,938 |
| Pumice (trass) | | 9,666 | 6,981 | 5,808 | 6,922 | 7,359 |
| Salt: | | | | | | |
| Rock | thousand tons | 1 | 1 | 2 | 1 | 1 |
| In brine: | | | | | | |
| Evaporated | do. | 419 | 438 | 486 | 484 | 413 |
| Other[e] | do. | r241 | r254 | 215 | 180 | e230 |
| **Total** | **do.** | **r660** | **r692** | **701** | **664** | **643** |
| Sand and gravel: | | | | | | |
| Quartz sand | do. | 782 | 735 | 798 | 684 | 756 |
| Other sand and gravel | do. | 15,387 | 14,593 | 8,861 | 9,322 | 14,700 |
| **Total** | **do.** | **16,169** | **15,328** | **9,659** | **10,006** | **15,456** |
| Sodium compounds, n.e.s.:[e] | | | | | | |
| Carbonate, synthetic | do. | 150 | 150 | 150 | 150 | 130 |
| Sulfate, synthetic | do. | 50 | 50 | 55 | 55 | 50 |
| Stone:[2] | | | | | | |
| Dolomite | do. | 981 | 1,291 | 1,308 | 1,406 | 1,521 |
| Quartz and quartzite | do. | 223 | 176 | 196 | 196 | 167 |
| Other, including limestone and marble | do. | 11,903 | 11,667 | 9,250 | 9,540 | 12,324 |
| **Total** | **do.** | **13,107** | **13,134** | **10,754** | **11,142** | **14,012** |
| Sulfur: | | | | | | |
| Byproduct: | | | | | | |
| Of metallurgy | | 10,113 | 11,204 | 10,986 | 10,448 | 11,331 |
| Of petroleum and natural gas | | 28,342 | 24,250 | 29,348 | 24,946 | 36,217 |
| From gypsum and anhydrite | | 26,449 | 26,547 | 23,837 | 13,091 | — |
| **Total** | | **64,904** | **62,001** | **64,171** | **48,485** | **47,548** |

See footnotes at end of table.

TABLE 2—Continued

## AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

| Commodity | | 1984 | 1985 | 1986 | 1987[P] | 1988[P] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Talc and soapstone | | 134,011 | 131,454 | 133,319 | 129,959 | 132,974 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal, brown and lignite | thousand tons | 2,901 | 3,081 | 2,969 | 2,786 | 2,129 |
| Coke | do. | 1,854 | 1,751 | 1,744 | 1,727 | 1,744 |
| Gas, natural: | | | | | | |
| Gross | million cubic feet | 44,931 | 41,102 | 39,269 | 41,223 | 44,657 |
| Marketed | do. | 37,084 | 34,325 | 32,537 | 34,330 | [e]35,000 |
| Oil shale | | 970 | 620 | 400 | 1,090 | 210 |
| Petroleum: | | | | | | |
| Crude | thousand 42-gallon barrels | 8,404 | 7,999 | 7,783 | 7,410 | 5,196 |
| Refinery products: | | | | | | |
| Gasoline | do. | 17,499 | 18,184 | 18,023 | 20,054 | 20,223 |
| Kerosene and jet fuel | do. | 1,461 | 1,452 | 1,381 | 1,546 | 1,706 |
| Distillate fuel oil | do. | 15,538 | 16,482 | 18,582 | 18,917 | 22,334 |
| Residual fuel oil | do. | 13,064 | 16,040 | 13,530 | 12,411 | [e]12,400 |
| Lubricants | do. | 557 | 604 | 1,591 | ([3]) | — |
| Liquefied petroleum gas | do. | 5,509 | 5,479 | 5,145 | 6,476 | [e]6,000 |
| Bitumen | do. | 1,658 | 1,363 | 1,427 | 1,382 | 1,427 |
| Unspecified | do. | 235 | 182 | 220 | 82 | [e]100 |
| Refinery fuel and losses | do. | 3,090 | 3,292 | 3,502 | 3,620 | [e]3,500 |
| **Total** | **do.** | **58,611** | **63,078** | **63,401** | **64,488** | **[e]67,690** |

[e] Estimated. [P] Preliminary. [r] Revised.

[1] Table includes data available through Aug. 1989.

[2] Excluding stone used by the cement and iron and steel industries.

[3] Revised to zero.

tion plant to operate at the South African Iron and Steel Industrial Corp. (ISCOR) in Pretoria, the Republic of South Africa. Reportedly, ISCOR started up a 300,000-ton-per-year plant at the end of 1988. The only other plant using the Corex technology was a smaller pilot plant at Kahl, the Federal Republic of Germany. Voest also established a new Brazilian subsidiary to introduce its Corex ironmaking in Latin America. The United States was a possible location for the first Corex second-generation plant.

Austrian special steel producer Bohler AG completed the expansion of its production facilities for press plate at Murzzuschlag. Bohler was the largest foreign subsidiary of Vereinigte Edelstahlwerke AG. From 90% to 95% of its total sheets and plates were exported to 51 countries. The major markets were Western Europe and the Far East. Bohler has also secured an order for valve steel for delivery to the Soviet car industry. This followed previous valve steel sales to the Federal Republic of Germany, as well as high-speed steel shipments to the U.S.S.R.[8]

**Lead and Zinc.**—The only operating lead and zinc mine at Bleiberg-Kreuth was run by the nationalized Bleiberger Bergwerks-Union AG (BBU). In 1988, BBU cut its work force of 379 workers by over 50%. It concentrated its underground mining in smaller areas, restricting operations to a few larger ore bodies. BBU virtually shut down its operations at Bad Bleiberg. BBU also owned the lithium deposit at Koralpen.

**Molybdenum.**—Reportedly, a new computer-controlled mill was installed several years ago at Metallwerk Plansee GmbH for rolling molybdenum flat products. Austria was 100% dependent on imports for its molybdenum requirements, imports purchased mostly from the Federal Republic of Germany, with some from the United Kingdom and Italy; Austria imported about 31,000 pounds of molybdenum contained in concentrate. The new mill

TABLE 3

## AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1986 | 1987 | Destinations, 1987 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS | | | | |
| Aluminum: | | | | |
| Ore and concentrate | 626 | 277 | — | All to West Germany. |
| Metal including alloys: | | | | |
| Unwrought | 31,317 | 39,447 | — | West Germany 14,282; Italy 7,588; France 6,752. |
| Semimanufactures | 102,564 | 113,955 | 1,368 | West Germany 43,450; Italy 12,863; Switzerland 8,719. |
| Copper: | | | | |
| Matte and speiss including cement copper | 2 | NA | | |
| Metal including alloys: | | | | |
| Unwrought | 24,327 | 23,846 | — | Italy 12,502; West Germany 8,090; Iraq 1,026. |
| Semimanufactures | 18,869 | 23,003 | 210 | West Germany 7,539; Italy 5,014; France 2,546. |
| Iron and steel: | | | | |
| Iron ore and concentrate excluding roasted pyrite | 7,769 | 67 | — | All to Brazil. |
| Metal: | | | | |
| Scrap | 22,305 | 92,200 | — | Italy 79,426; West Germany 8,852. |
| Pig iron, cast iron, related materials | 7,671 | 7,016 | 182 | France 2,021; West Germany 1,716; Italy 664. |
| Ferroalloys, unspecified | 12,857 | 13,322 | 360 | Italy 1,916; West Germany 1,670; India 1,640. |
| Steel, primary forms | 324,261 | 355,226 | 41,882 | West Germany 189,144; Italy 53,027. |
| Semimanufactures: | | | | |
| Bars, rods, angles, shapes, sections | 338,956 | 338,882 | 2,390 | Italy 103,316; West Germany 102,195; France 37,361. |
| Universals, plates, sheets | 1,453,391 | 1,558,365 | 52,718 | West Germany 418,826; U.S.S.R. 355,429; Italy 271,681 |
| Hoop and strip | 181,268 | 182,537 | 428 | West Germany 67,481; Switzerland 23,398; Yugoslavia 22,666. |
| Rails and accessories | 62,686 | 90,391 | 4 | Switzerland 29,967; India 14,280; Peru 8,588. |
| Wire | 53,090 | 61,223 | 2,677 | West Germany 28,593; Italy 9,040; Switzerland 6,107. |
| Tubes, pipes, fittings | 415,516 | 488,342 | 20,857 | U.S.S.R. 203,889; West Germany 84,830; Italy 31,183. |
| Castings and forgings, rough | 12,091 | 12,308 | 322 | West Germany 6,586; Italy 1,163; Switzerland 892. |
| Lead: | | | | |
| Ore and concentrate | — | 1,022 | — | All to Yugoslavia. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1986 | 1987 | Destinations, 1987 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Lead—Continued | | | | |
| Metal including alloys: | | | | |
| Unwrought | 1,126 | 1,935 | — | Italy 161; Switzerland 484; West Germany 192. |
| Semimanufactures | 68 | 25 | — | West Germany 10; Belgium-Luxembourg 4; Saudi Arabia 4. |
| Nickel: | | | | |
| Matte and speiss | 56 | 23 | — | All to Yugoslavia. |
| Metal including alloys: | | | | |
| Unwrought | 29 | 2 | — | Greece 1; Yugoslavia 1. |
| Semimanufactures | 821 | 488 | 17 | West Germany 125; Bulgaria 57; Argentina 37. |
| Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands | $2,960 | $5,851 | $24 | West Germany $4,172; Yugoslavia $676; United Kingdom $649. |
| Silver: Metal including alloys, unwrought and partly wrought do. | $5,242 | $45,473 | — | West Germany $41,354; Switzerland $2,351. |
| Tin: Metal including alloys: | | | | |
| Unwrought | 17 | 26 | — | Mainly to West Germany. |
| Semimanufactures | (2) | 43 | — | Yugoslavia 33; Belgium-Luxembourg 8. |
| Zinc: Metal including alloys: | | | | |
| Unwrought | 4,035 | 4,704 | — | Italy 2,550; Yugoslavia 1,613; West Germany 343. |
| Semimanufactures | 165 | 197 | 16 | West Germany 93; Belgium-Luxembourg 25; Italy 25. |
| Other: | | | | |
| Ores and concentrates | 754 | 888 | 63 | Italy 452; Netherlands 125; West Germany 116. |
| Base metals including alloys, all forms | 8,891 | 8,656 | 101 | Italy 2,564; West Germany 2,285; United Kingdom 1,877. |
| Waste and sweepings of unspecified precious metals value, thousands | $6,615 | $5,943 | — | West Germany $5,140; France $455; Italy $238. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 140 | 172 | — | West Germany 168; Yugoslavia 4. |
| Dust and powder of precious and semiprecious stones including diamond value, thousands | $17 | $59 | $4 | West Germany $53; Poland $2. |
| Grinding and polishing wheels and stones | 13,831 | 12,665 | 182 | West Germany 2,364; Italy 1,488; France 982. |
| Asbestos, crude | 9 | — | | |
| Barite and witherite | 3 | 3 | 3 | |
| Boron materials: Crude natural borates | 3 | 100 | — | All to Yugoslavia. |
| Cement | 21,944 | 10,355 | — | West Germany 7,340; Italy 2,238; France 450. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Destinations, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Chalk | | 2,592 | 4,627 | 3 | Hungary 3,513; Czechoslovakia 781. |
| Clays, crude | | 74,655 | 69,673 | 1 | West Germany 31,674; Hungary 29,264. |
| Diamond: | | | | | |
| Gem, not set or strung | value, thousands | $741 | $444 | $92 | Switzerland $169; Israel $78. |
| Industrial stones | do. | $75 | $248 | — | Hungary $133; Czechoslovakia $90; Poland $13. |
| Diatomite and other infusorial earth | | 2,203 | 2,653 | — | Hungary 903; Bulgaria 575; Yugoslavia 522. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 13,078 | 6,894 | — | Czechoslovakia 6,523; Switzerland 305. |
| Manufactured | | 730,312 | 899,407 | 52 | West Germany 440,696; Italy 152,729; Czechoslovakia 95,634. |
| Graphite, natural | | 10,284 | 8,330 | 74 | West Germany 3,353; Poland 1,930; Italy 928. |
| Gypsum and plaster | | 119,295 | 117,279 | — | West Germany 115,543; Italy 1,641. |
| Lime | | 1,249 | 3,211 | — | West Germany 3,104; Hungary 56. |
| Magnesium compounds: Magnesite, crude | | 138,304 | 141,261 | 7,688 | Venezuela 32,780; West Germany 30,939; France 17,367. |
| Mica: | | | | | |
| Crude including splittings and waste | | 1,659 | 371 | — | West Germany 275; Italy 55; Yugoslavia 20. |
| Worked including agglomerated splittings | | 247 | 279 | (2) | West Germany 68; India 44; Yugoslavia 29. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | $450 | $392 | $59 | West Germany $112; Switzerland $102. |
| Synthetic | do. | $6,428 | $8,146 | $1,213 | West Germany $1,759; Egypt $1,735. |
| Pyrite, unroasted | | 7 | 139 | — | West Germany 137; Italy 3. |
| Salt and brine | | 1,621 | 2,727 | — | Italy 991; West Germany 866; Hungary 772. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 144,351 | 156,472 | 20 | West Germany 97,033; Switzerland 56,576. |
| Worked | | 66,150 | 39,393 | 105 | West Germany 31,914; Switzerland 6,012. |
| Dolomite, chiefly refractory-grade | | 29,569 | 30,595 | — | West Germany 23,191; Venezuela 6,700. |
| Gravel and crushed rock | | 691,135 | 772,816 | 17 | Switzerland 456,074; West Germany 287,039. |
| Limestone other than dimension | | 917 | 724 | — | All to West Germany. |
| Quartz and quartzite | | 52 | 32 | — | Czechoslovakia 16; Switzerland 13. |
| Sand other than metal-bearing | | 97,709 | 116,792 | — | West Germany 77,810; Switzerland 35,693. |
| Sulfur: Elemental: Crude including native and byproduct | | 419 | 76 | — | Hungary 56; Yugoslavia 11; West Germany 10. |
| Talc, steatite, soapstone, pyrophyllite | | 113,369 | 120,177 | 47 | West Germany 59,223; Italy 18,272; Switzerland 10,284. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Destinations, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Other: | | | | | |
| Crude | | 20,475 | 12,317 | 132 | West Germany 5,243; United Kingdom 2,011; Switzerland 1,179. |
| Slag and dross, not metal-bearing | | 92,220 | 93,622 | — | West Germany 90,648; Switzerland 2,366. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 2 | 51 | — | Italy 18; U.S.S.R. 14; Iraq 9. |
| Coal: | | | | | |
| Anthracite and bituminous | | 50 | 21 | — | All to Yugoslavia. |
| Briquets of anthracite and bituminous coal | | 83 | 72 | — | All to Switzerland. |
| Lignite including briquets | | 5,437 | 4,433 | — | West Germany 4,365; Switzerland 68. |
| Coke and semicoke | | 5,107 | 4,574 | — | West Germany 4,518; Switzerland 56. |
| Peat including briquets and litter | | 10,580 | 14,983 | — | Italy 8,742; West Germany 6,058. |
| Petroleum: | | | | | |
| Crude | 42-gallon barrels | — | 7 | — | All to West Germany. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | 49 | 82 | — | Italy 59; Yugoslavia 18. |
| Gasoline, motor | do. | 1,585 | 2,731 | — | Mainly to West Germany. |
| Mineral jelly and wax | do. | 130 | 46 | — | Netherlands 38; Switzerland 4. |
| Kerosene and jet fuel | do. | 26 | 96 | (2) | Yugoslavia 59; West Germany 35. |
| Distillate fuel oil | do. | 164 | 35 | — | West Germany 28; Yugoslavia 4; Romania 3. |
| Lubricants | do. | 430 | 396 | (2) | Hungary 121; Czechoslovakia 103; Turkey 36. |
| Residual fuel oil | do. | 1,383 | (2) | — | All to Yugoslavia. |
| Bitumen and other residues | do. | 30 | 19 | — | West Germany 9; Switzerland 3; Malta 3. |
| Bituminous mixtures | do. | 42 | 30 | (2) | Algeria 14; West Germany 11. |
| Petroleum coke | do. | 1 | 2 | — | All to Yugoslavia. |

NA Not available.
[1] Table prepared by P.I. Roetzel.
[2] Less than 1/2 unit.

machinery was capable of rolling molybdenum plates and sheets up to 40 millimeters thick, 850 millimeters wide, and 3,000 millimeters long. The mill was supplied to Plansee by the Federal Republic of Germany heavy equipment manufacturer Mannesmann Demag AG. Its products were shipped to worldwide markets for use in the automobile and aerospace industries and for use as an alloying additive for minerals applications.

Plansee is an Austrian high-technology firm with headquarters in Reutte, near the Plansee, Tirol. The site of Reutte was chosen, not for its beauty, but for the availability of hydroelectric power at the nearby Plansee. The company employed 1,850 workers in 1988. The family-owned company was founded in 1921 by Paul Schwarzkopf. Plansee sold hard metals and high-melting-point metals and composites based on molybdenum, niobium, rhenium, tantalum, and tungsten. Plansee developed processes, including those utilizing powder metallurgy, to work these metals. Plansee was the largest powder metallurgy firm in Europe. The firm turned out about 50,000 different products, including cutting tools. Over 90% of its sales were

TABLE 4

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS | | | | |
| Aluminum: | | | | |
| Ore and concentrate | 312,800 | 315,644 | 151 | West Germany 173,354; Hungary 53,945; France 47,940. |
| Metal including alloys: | | | | |
| Unwrought | 93,413 | 81,133 | 2 | West Germany 42,884; Norway 17,742; France 3,512. |
| Semimanufactures | 54,559 | 63,506 | 17 | West Germany 24,047; Switzerland 9,302; Italy 8,108. |
| Copper: | | | | |
| Ore and concentrate | — | 52 | — | United Kingdom 31; Italy 21. |
| Metal including alloys: | | | | |
| Unwrought | 12,499 | 8,901 | 35 | Republic of South Africa 4,274; West Germany 2,392; Zimbabwe 530. |
| Semimanufactures | 77,504 | 79,027 | 40 | West Germany 42,633; Italy 9,282; United Kingdom 6,995. |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite thousand tons | 3,201 | 3,311 | — | U.S.S.R. 1,237; Sweden 885; Canada 413. |
| Pyrite, roasted do. | 13 | 27 | — | Mainly from Yugoslavia. |
| Metal: | | | | |
| Scrap | 115,029 | 68,523 | 25 | West Germany 34,885; Czechoslovakia 21,117; U.S.S.R. 8,348. |
| Pig iron, cast iron, related materials | 43,815 | 41,815 | 2 | Canada 12,355; West Germany 10,781; U.S.S.R. 7,383. |
| Ferroalloys | 68,237 | 63,502 | 164 | West Germany 11,309; Norway 10,384; Czechoslovakia 3,570. |
| Steel, primary forms | 230,101 | 162,192 | 8 | Hungary 76,920; West Germany 41,060; Czechoslovakia 35,657. |
| Semimanufactures: | | | | |
| Bars, rods, angles, shapes, sections | 326,229 | 342,458 | 57 | Italy 118,208; West Germany 112,149; Switzerland 29,924. |
| Universals, plates, sheets | 280,380 | 270,984 | 83 | West Germany 115,131; Belgium-Luxembourg 48,686; Italy 20,398. |
| Hoop and strip | 98,820 | 98,679 | 52 | West Germany 57,361; Italy 16,325; Switzerland 7,938. |
| Rails and accessories | 2,734 | 2,521 | 1 | West Germany 2,098; Switzerland 154. |
| Wire | 36,617 | 41,361 | 4 | Belgium-Luxembourg 14,034; West Germany 11,503; Italy 6,669. |
| Tubes, pipes, fittings | 228,840 | 241,058 | 51 | Italy 84,830; West Germany 84,715; East Germany 12,239. |
| Castings and forgings, rough | 14,744 | 14,482 | 1 | West Germany 10,964; Italy 1,218. |
| Lead: | | | | |
| Ore and concentrate | 4,124 | 1,152 | — | Italy 1,052; Spain 100. |

See footnotes at end of table.

TABLE 4—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Lead—Continued | | | | |
| Metal including alloys: | | | | |
| Unwrought | 38,516 | 31,476 | 261 | West Germany 8,282; United Kingdom 7,429; Republic of South Africa 5,330. |
| Semimanufactures | 997 | 825 | — | West Germany 762; Belgium-Luxembourg 25. |
| Manganese: Ore and concentrate, metallurgical-grade | 437 | 472 | — | Australia 225; Netherlands 182. |
| Nickel: | | | | |
| Matte and speiss | 907 | 405 | 15 | Netherlands 178; Republic of South Africa 58; Norway 48. |
| Metal including alloys: | | | | |
| Unwrought | 3,029 | 2,815 | 13 | Republic of South Africa 621; U.S.S.R. 340; Canada 313. |
| Semimanufactures | 679 | 580 | 43 | West Germany 379; United Kingdom 49. |
| Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands | $4,426 | $9,534 | $2,498 | West Germany $4,482; United Kingdom $735. |
| Silver: | | | | |
| Waste and sweepings[2] do. | $133 | $142 | — | All from Yugoslavia. |
| Metal including alloys, unwrought and partly wrought do. | $14,922 | $33,499 | $7 | West Germany $24,041; Belgium-Luxembourg $6,939; Yugoslavia $960. |
| Tin: Metal including alloys: | | | | |
| Unwrought | 523 | 512 | 15 | West Germany 217; China 128; Thailand 38. |
| Semimanufactures | 152 | 170 | (3) | West Germany 142; Netherlands 20. |
| Zinc: | | | | |
| Ore and concentrate | 10,133 | 16,688 | — | Netherlands 16,687. |
| Metal including alloys: | | | | |
| Unwrought | 11,433 | 10,282 | — | West Germany 4,437; Belgium-Luxembourg 3,159; Netherlands 1,281. |
| Semimanufactures | 4,091 | 4,980 | — | West Germany 2,701; Belgium-Luxembourg 1,056; France 584. |
| Other: | | | | |
| Ores and concentrates | 63,485 | 53,351 | 3,694 | Republic of South Africa 34,360; Cuba 3,298. |
| Base metals including alloys, all forms | 19,014 | 3,960 | 121 | U.S.S.R. 2,729; West Germany 304; Republic of South Africa 226. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 622 | 1,656 | 18 | Italy 706; Turkey 472; West Germany 359. |
| Dust and powder of precious and semiprecious stones including diamond value, thousands | $8,668 | $9,002 | $8,188 | Switzerland $417; Ireland $220. |
| Grinding and polishing wheels and stones | 1,705 | 1,726 | 2 | West Germany 863; Italy 317; Spain 150. |

See footnotes at end of table.

TABLE 4—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Asbestos, crude | | 15,148 | 17,749 | 7 | Canada 10,600; U.S.S.R. 3,699; Zimbabwe 1,990. |
| Barite and witherite | | 9,067 | 3,112 | — | West Germany 2,173; Turkey 501; Czechoslovakia 369. |
| Boron materials: Crude natural borates | | 17,862 | 17,523 | 3,013 | Turkey 14,304; Netherlands 204. |
| Cement | | 88,551 | 94,364 | 8 | Yugoslavia 38,181; Poland 19,547; Italy 14,031. |
| Chalk | | 12,000 | 10,188 | 1 | Italy 7,256; France 1,477; West Germany 1,353. |
| Clays, crude | | 188,215 | 198,278 | 3,114 | West Germany 76,605; Czechoslovakia 63,357; Brazil 26,868. |
| Cryolite and chiolite | | 204 | 191 | — | Denmark 190. |
| Diamond: | | | | | |
| Gem, not set or strung | value, thousands | $5,362 | $7,465 | $135 | Israel $3,003; Belgium-Luxembourg $2,325; India $651. |
| Industrial stones | do. | $654 | $548 | $8 | West Germany $193; Hungary $87; Republic of South Africa $69. |
| Diatomite and other infusorial earth | | 14,271 | 13,049 | 1,506 | Czechoslovakia 4,938; Denmark 2,842; Hungary 1,654. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 439,697 | 366,170 | 34,379 | Algeria 144,634; Syria 112,437. |
| Manufactured | | 651,679 | 606,194 | 13,603 | West Germany 213,426; East Germany 89,412; France 75,375. |
| Graphite, natural | | 4,966 | 2,083 | 11 | China 1,472; West Germany 260; Republic of Korea 182. |
| Gypsum and plaster | | 12,749 | 12,381 | (2) | West Germany 11,799; Italy 379. |
| Lime | | 3,802 | 4,253 | — | Yugoslavia 2,750; West Germany 581; Poland 416. |
| Magnesium compounds | | 122,064 | 108,652 | 3 | Turkey 33,339; Italy 21,780; Mexico 13,906. |
| Mica: | | | | | |
| Crude including splittings and waste | | 183 | 221 | — | West Germany 90; Norway 58; Sweden 36. |
| Worked including agglomerated splittings | | 226 | 246 | (2) | France 124; Belgium-Luxembourg 56; India 23. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | $3,121 | $3,844 | $48 | West Germany $1,748; Switzerland $544; Belgium-Luxembourg $362. |
| Synthetic | do. | $2,531 | $1,764 | $249 | Switzerland $466; U.S.S.R. $340. |
| Pyrite, unroasted | | 668 | 655 | — | Italy 475; West Germany 175. |
| Salt and brine | | 211 | 642 | (2) | West Germany 541; France 63. |

See footnotes at end of table.

TABLE 4—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 43,003 | 48,656 | 13 | Italy 24,301; Republic of South Africa 6,308; France 3,485. |
| Worked | | 61,319 | 73,637 | — | Italy 54,713; West Germany 9,643; Yugoslavia 3,580. |
| Dolomite, chiefly refractory-grade | | 10,894 | 9,969 | — | West Germany 8,795; Italy 813. |
| Gravel and crushed rock | | 204,855 | 217,478 | — | West Germany 189,213; Italy 21,977; Hungary 4,614. |
| Limestone other than dimension | | 1,610 | 2,288 | — | Yugoslavia 1,626; West Germany 575. |
| Quartz and quartzite | | 25,881 | 19,007 | — | West Germany 9,528; Hungary 8,511. |
| Sand other than metal-bearing | | 366,563 | 374,586 | 2 | Czechoslovakia 180,068; West Germany 178,928; Hungary 7,053. |
| Sulfur: Elemental: Crude including native and byproduct | | 90,590 | 82,590 | — | Poland 30,936; West Germany 23,351; Hungary 19,198. |
| Talc, steatite, soapstone, pyrophyllite | | 6,198 | 10,698 | 1 | India 4,451; Australia 3,175; France 2,268. |
| Other: | | | | | |
| Crude | | 72,967 | 74,109 | 1,228 | Hungary 25,013; West Germany 21,173; Greece 8,572. |
| Slag and dross, not metal-bearing | | 41,900 | 25,859 | (3) | West Germany 15,977; Italy 7,314; Yugoslavia 1,159. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 2,654 | 1,933 | 58 | Trinidad and Tobago 1,366; West Germany 244; Hungary 215. |
| Coal: | | | | | |
| Anthracite and bituminous | thousand tons | 3,731 | 4,133 | 495 | Poland 898; U.S.S.R. 812; Czechoslovakia 591. |
| Briquets of anthracite and bituminous coal | do. | 22 | 22 | — | West Germany 21; Belgium-Luxembourg 1. |
| Lignite including briquets | do. | 686 | 494 | — | East Germany 290; West Germany 189. |
| Coke and semicoke | do. | 889 | 843 | — | Czechoslovakia 267; West Germany 170; Poland 156. |
| Peat including briquets and litter | | 62,687 | 66,854 | — | West Germany 47,222; U.S.S.R. 12,907; Hungary 3,224. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 45,244 | 46,536 | — | Libya 13,261; Iraq 5,638; Algeria 4,849. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 36,392 | 35,503 | (3) | U.S.S.R. 33,052; West Germany 1,432; Hungary 695. |
| Gasoline, motor | do. | 4,522 | 4,368 | — | Italy 2,043; West Germany 1,310; Hungary 687. |
| Mineral jelly and wax | do. | 123 | 124 | (3) | West Germany 47; Poland 31; Hungary 27. |
| Kerosene and jet fuel | do. | 754 | 929 | (3) | Hungary 591; Czechoslovakia 144; West Germany 121. |

See footnotes at end of table.

TABLE 4—Continued

**AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]**

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Petroleum—Continued | | | | | |
| Refinery products—Continued | | | | | |
| Distillate fuel oil | thousand 42-gallon barrels | 3,368 | 2,985 | 1 | Hungary 923; Czechoslovakia 899; West Germany 573. |
| Lubricants | do. | 5,402 | 7,924 | 9 | Hungary 4,113; Czechoslovakia 1,515; Yugoslavia 985. |
| Residual fuel oil | do. | 7,399 | 6,153 | — | Czechoslovakia 2,653; West Germany 2,064; Yugoslavia 1,299. |
| Bitumen and other residues | do. | 1,981 | 1,860 | — | West Germany 927; Yugoslavia 445; Hungary 283. |
| Bituminous mixtures | do. | 32 | 64 | (3) | West Germany 54; Netherlands 5; Italy 3. |
| Petroleum coke | do. | 484 | 571 | 166 | West Germany 271; U.S.S.R. 46. |

[1] Table prepared by P. J. Roetzel.
[2] May include other precious metals.
[3] Less than 1/2 unit.

abroad, mainly to EC countries, the United States, and Japan. Only a small percentage of exports went to Eastern Europe.

**Tungsten.**—Austria was one of the major international producers of tungsten, which is produced in a mine at Mittersill that is operated by Wolfram Bergbau-und Huttengesellschaft mbH. The Mittersill mine in the beautiful Salzburg mountains is exceptional because only the mine entry is visible on the mountain slope. All other operations except the settling pond are located underground; the mine is situated in a national park. Mining work started in 1975 at an altitude of more than 2,000 meters as an open pit operation, which is now entirely underground.

In 1988, the underground mine excavated 500,000 tons of rock. Mittersill was one of Europe's three tungsten mines, the two others being in Portugal and Sweden. The Austria scheelite ore contained an average of only 0.5% of tungsten. Ore reserves were estimated to be 10 million tons. Because of the hardness of the rock, the drill bit sometimes had to be replaced every 20 meters. After drilling, blasting, and primary crushing, the ore was transported to the concentrator along a 2.7-kilometer underground conveyor belt. Despite a decline in production during the last 5 years, the company still produced good financial results. Of the nearly 96 people employed, 66 worked in the underground mine and processing mill.

**Other Metals.**—BBU, which mined antimony, lead, and zinc ores, closed some uneconomical pits. While still showing a loss, BBU's situation improved in 1988, because of higher world zinc prices. BBU's lead and zinc deposits were expected to last beyond the year 2000. BBU planned to close its antimony mine in Schlaining, Burgenland Province, in 1990. Following reorganization, BBU was expected to operate profitably again within the next 2 to 3 years. BBU was developing new business activities, including converting its closed-down tunnels for use by tourists seeking adventure, health care, and recuperation.

***Industrial Minerals.*—Fertilizer Materials.**—Restructuring of Austria's largest chemical industry, formerly known as Chemie Linz AG, now the Chemie Holding AG, led to an overall positive cash flow of approximately $37.4 million in the first half of 1988. The company produced fertilizers, gypsum, pharmaceuticals, and plastics. The company reduced its work force, and was planning to lay off 3,000 of its 8,500 employees; 1,000 of them were cut in 1987. The same range of products was retained.[9]

**Graphite.**—Nearly all the graphite produced in Austria was amorphous. Austria was the leading producer of graphite in Western Europe, followed by the Federal Republic of Germany. Most of the production was carried out in Steiermark, Styria, and Niederosterreich, Lower Austria. Industrie-und

Bergbaugesellschaft Pryssok u. Co. KG operated opencast mines at Donnau, Muehldorf, and Spitz. Production capacity was about 30,000 tons per year of microcrystalline graphite, grading 50% carbon. All of this production was sold to the Austrian steel industry. Another company, Grafitbergbau Kaiserberg Franz Mayr-Meinhof & Co., produced about 14,000 tons of graphite per year from its mine at Kaiserberg-Leims, near St. Michael. About 90% of the company's products were exported, mostly to EC and COMECON countries.[10] Some highly refined products were also exported to developing countries. In addition to traditional iron and steel applications, Grafitbergbau was promoting graphite as an additive for high-technology products. The company was planning an expansion of its five grinding and flotation facilities and the construction of a new laboratory.[11]

**Lithium.**—The OIAG subsidiary Minerex, which was responsible for exploring works for lithium in the Koralpe area, was liquidated in 1988. Its activities were all transferred to BBU. A market study showed that, despite the excellent lithium content at Koralpe, present low market prices for lithium did not allow profitable mining. However, BBU was negotiating with joint-venture partners because lithium mining on the Koralpe was expected to be profitable in the medium term.

**Magnesite.**—The largest producer of magnesite in Austria, Osterreichische-Amerikanische Magnesit AG, or Radex AG, became a private Austrian company through its purchase by an Austrian investor. The company was previously owned by the General Refractories Co. of Philadelphia, Pennsylvania, United States.

Radex performed quite well. In 1988, Radex increased its net sales by 6.2%. Investments in fixed assets were more than twice as high as in the previous few years. This fact was reflected in exports to the United States, which had not existed previously and amounted to $813,000 in 1988. The Radex plant in Greece was expected to be expanded with a $12.2 million investment for rock wool production. Also, Radex bought a 10% share of Ceramico Caroni in Venezuela, which was in the center of the fast-growing aluminum industry, also a customer for Radex's refractories. Magnesite for consumption in Venezuela was to be shipped from Austria, since no magnesite has been found in Venezuela to date. In Indonesia, Radex engaged in a joint venture; Radex held 30%, the Government of Indonesia held 10%, and the rest was held by two Indonesian partners. In Australia, Radex obtained a 10% share in one of the country's biggest magnesite deposits; 50% was held by Queensland Metals Mining and 40% by Pancontinental, which in turn held a 20% share in Radex. Radex spent more than 4% of its refractories turnover on research and development, a rather high share for a magnesite producer.

**Other Industrial Minerals.**—Cement, clay minerals, salt, sand and gravel, sodium sulfate, and thallium were other industrial minerals produced in Austria. Except for salt, all these minerals continued to be produced with increased output.

Magnolithe GmbH operated a dunite quarry at St. Stefan, near Leoben in Styria. The raw material was transported by truck to the company's plant at St. Lorenzen, near Knittelfeld, 15 kilometers from the quarry. The dunite was sintered in a rotary kiln having a capacity of about 38,000 tons per year. Actual output was about 24,000 tons per year. The sintered material was then crushed and graded for a number of applications.[12]

***Mineral Fuels.***—The principal aim of the Austrian energy research and development program was to reduce dependence on imported primary energy. Major efforts have been initiated in energy conservation, new and environmentally benign techniques, and renewable energy source technologies. Austria emphasized the development of fluidized-bed combustion technology and encouraged research on the nature and reduction of emissions of airborne pollutants from industry, traffic, and combustion of biomass. Austria collaborated in international research projects.

**Coal.**—Austrian coal mines were still in trouble. Wolfsegg-Traunthaler Kohlenwerks AG (WTK) was almost closed in 1988, but was instead scheduled to be phased out over the following 3 to 6 years because of dwindling deposits and the infeasibility of strip mining. Salzach-Kohlenbergbau-Gesellschaft mbH (SAKOG) closed the Trimmelkam pit but continued operating its other pits. SAKOG will survive until the year 2000 but not much beyond that. After losing important markets in Carinthia and Salzburg Provinces, due to stringent clean air acts, SAKOG had only the Province of Upper Austria left in which to sell its coal to households. The Riedlerbach powerplant was still a SAKOG customer. The Graz-Koflacher Eisenbahn- und Bergbaugesellschaft mbH (GKB) also had problems; in addition to the Zangtal pit, GKB operated the open strip in Oberdorf and only one pit, the Karlschacht, scheduled to be closed around 1990.

Brown coal was mined from the Trimmelkam deposit in the West Styrian mining area near Koflach, northwest of Salzburg, and in the region of the Hausruck Range at Ampflwang. The largest Austrian coal company was GKB, a subsidiary of Voest, in the West Styrian mining area. GKB's output came from opencast mines at Oberdorf and Zangtal, and from underground mines at Zangtal and Karlschacht. At the Zangtal opencast pit, the brown coal was mined from a residual pillar in the top seam. The mining started in April 1987; slopes near a Federal highway and in the vicinity of buildings

were reinforced with anchored steel pilings. Coal from the Zangtal underground mine was extracted by longwall workings from a small pillar and from the main coal seam. At the Karlschacht underground mine, there were five Alpine-miners of the AMN 50 type extracting coal by stripping in five levels. At the end of 1987, GKB employed 1,184 workers and 213 office staffers.

The second largest coal company, SAKOG, closed its Trimmelkam underground mine, mined the Taksdorf opencast pit, and was exploring in the Weilhart Field. The third largest company, WTK, operated the Schmitzberg and Hinterschlagen underground mines near Ampflwang in the Hausruck Range and opencast pits at Heissler and Innerleiten. At the end of 1987, the total number of workers was 659 people, of whom 555 were laborers.[13]

**Natural Gas.**—Natural gas was produced by OMV, which accounted for about 60% of total output, and by Rohol-Aufsuchungs GmbH (RAG), which produced 40% of output. For the first time in 5 years, domestic gas production increased by about 8% in 1988, largely due to the newly developed gas and condensate field Hoeflein in the Vienna basin. OMV handled all gas imports and managed gas transport lines. OMV made a gas discovery at the Molln-1 well in the Alps, east of Salzburg. The find was 15 miles northeast of the Gruenau-1 oil discovery made in 1987.[14]

The RAG's wildcat 1 Weizberg in western Austria, flowed gas at the rate of 7 million cubic feet per day during an open hole test. The company was a 50–50 joint venture of Royal Dutch-Shell Group and Mobil Corp.

The Austrian gas transit pipelines, Trans-Austria-Gasleitung (TAG) and West-Austria-Gasleitung, shipped 13.1 billion cubic meters of natural gas from the U.S.S.R. to gas companies in France, Italy, and Yugoslavia. A second pipeline (TAG II) was built parallel to TAG, increasing transport capacity from 10 to 20 billion cubic meters per year.

**Petroleum.**—Indigenous production of oil decreased in 1986 and 1987 while imports of crude oil and oil products increased by 4.1% in 1986. In 1988, production increased substantially. Austria's only refinery, in Schwechat near Vienna, had an annual capacity of 10 million metric tons and an 80% utilization rate, which is a relatively high rate for Europe. The refinery was supplied with imported crude oil by a single pipeline from Italy. Libya was the most important supplier of crude oil.

OMV sold 15% to private market, while OIAG retained ownership of the remaining 85% share. OMV was increasing its exploration and drilling activities abroad to decrease its dependence on oil imports.

The recent amendment of the oil stockpiling and reporting law requires that all oil companies and importers keep 16% of their mandatory storage obligations with the Erdol Lagergesellschaft (ELG), a stockholding entity created some years ago. This practice should enhance the availability of emergency stocks in a supply disruption without conflicting with the commercial interests of the holder. The further increase of the ELG stocks and their eventual availability in a crisis was expected to improve the emergency response capability of Austria.

Mobil and Shell made a petroleum discovery near Salzburg at the Muhlreith-1 well, drilled by their jointly owned subsidiary Rohol-Aufsuchungs. A test produced oil at a rate equivalent to 2,500 barrels per day.

## SWITZERLAND[15]

Although Switzerland lies in a rugged mountain region in Central Europe covering about 41,000 square kilometers, it is devoid of any significant mineral resources. Most of the mineral deposits were small and diversified, but mining activity had virtually stopped long ago because of uneconomic deposits. Switzerland's two aluminum producers were at Valais, a bilingual canton famous for its ski slopes and mountains. The general geology of Switzerland had been studied in detail, but mineral exploration to assess the country's grades of ores and reserves was as yet incomplete. An office for the geological survey, as a specialized Government agency, did not exist, nor was there a Government agency or bureau for mines and mining. The country was subdivided into five major geological provinces by geologists. Each province was correlated to the presence of mineral occurrences; they are listed from north to south as follows: the Jura, the Molasse Basin, the Cretaceous Alps, the Hercynian Massifs, and the Penninic, Austroalpine, and southern Alps. Most of the ore occurrences were in the last three Provinces. Unemployment was essentially nonexistent, even dropping slightly in 1988, and there was a shortage of skilled labor. At the end of June 1988, the unemployment rate stood at 0.7%, while job vacancies increased by 10%. The number of foreign workers increased during the past few years in all sectors of industry, amounting to about 27% at the end of June 1988. Salaries were among the highest in the world.

### Production

All metallic commodities, such as aluminum, secondary lead, and steel were produced from imported raw materials; domestic mineral industry was limited to a few construction minerals and salt. Except for hydroelectric power and a small quantity of natural gas production, all mineral fuels were also imported. Economic growth increased slightly over the previous year and was estimated to have grown by about 2.6% in terms of the GDP. Switzerland's exports of goods and services amounted to more than 43% of its GDP. Industrial production grew by just 1% in 1987 and recovered to nearly

a 3% average annual increase in 1988. Tourism and banking composed almost the sole input to the economy with only a small percentage contributed by the aluminum and steel industries. The industrial minerals mined domestically remained at essentially the same production level for the past 3 years, while steel and petroleum refinery products continued a slow but gradual decline. On November 12, 1988, the only major Swiss aluminum company, Swiss Aluminium Ltd., celebrated its 100th anniversary.

**Trade**

Trade was vital for a country with few natural resources and a small domestic market. Switzerland had become a center for a great number of international trading companies. Some were Swiss firms with a long trading history, and others were relatively recent arrivals from abroad. Based in Lausanne, Borzx S.A. traded fuel products such as metallurgical and petroleum coke and coal. These fuels were mostly imported from the United States and resold mainly to Mediterranean countries, including Spain and Italy. Marc Rich S.A. was one of the best known companies in Switzerland specializing in oil and metals with 40 offices around the world. A large number of other traders in metal had offices in Switzerland. Norway's metal producer, Norsk Hydro A/S, operated an office in Lausanne, and Belgium's Société Générale de Belgique S.A. also had a trading office in the same city. They joined a number of domestic light metal traders in Lausanne, such as Intermetal and Minmeta, and others in Geneva, such as Minemet.[16]

A landlocked country, Switzerland used the ports of Belgium, France, the Federal Republic of Germany, Italy, and the Netherlands for exports and imports. Principal trade partners were France, the Federal Republic of Germany, Italy, and the United Kingdom (all members of the EC), Austria, and the United States. The Federal Republic of Germany was the largest bilateral trade partner and one with which the Swiss ran a substantial deficit. Although not a member of the EC, Switzerland opted to follow a policy of "external adaptation" to EC conditions and requirements. The EC accounted for 50% of Switzerland's total exports and 70% of all imports. About 9% to 10% of Swiss exports went to the United States. Exports by the metallurgical and machine-building industries were strong, and the jewelry and precious stones sectors also recorded growth. Precious stones were imported for resale. The strength and growth of the overall Swiss economy during the past year spurred the increase of U.S. imports by about 13%. Switzerland ranked fifth in importance as a foreign investor in the United States. Switzerland invested in 750 U.S. firms and employed 181,729 U.S. citizens.

**Commodity Review**

***Metals.*—Aluminum.**—The two Swiss aluminum companies, Swiss Aluminium Ltd. (Alusuisse) and the smaller Usine d'Aluminium Martigny S.A., continued to show progress for the third year. Alusuisse produced aluminum metal, fabricated metals, and chemicals, based on imported alumina and bauxite. The company marked its 100th anniversary on November 12, 1988. It had started 2 years after primary aluminum was successfully produced in Europe for the first time by fused-salt electrolysis. Since 1986, when the company was almost bankrupt, restructuring had been undertaken to return to profitability. The labor force was cut, money-losing companies abroad were divested, and operational costs were reduced. The company limited its activities in aluminum and chemicals. The company became profitable again in 1988, and simultaneously improved its productivity and quality. Alusuisse reported profits of $211 million[17] in 1988, and earnings were up 22.4% over those of 1987. The company's Aluminum Div. accounted for about 70% of consolidated group sales, which increased 17.9% from 1987 and amounted to about $4 billion. The company's Chemicals Div. was operated through Lonza Ltd., an association that had lasted for 25 years.[18]

Alusuisse's three plants, in the Valais Canton at Chippis, Fierre, and Steg, employed 2,174 people, who earned $87 million in wages. The company's facilities included a new power generating plant. The establishment of electrochemical and metallurgical industries in the Valais was due mainly to the availability of hydropower. Alusuisse and Lonza decided to build their own power station. One hundred years ago, the Rheinkraftwerk Neuhausen, the first power station on the Lonza River was built for aluminum and chemicals production. After the construction of the powerplant, the first metal in Chippis was produced in 1908. A third power station was completed in 1909. By 1918, the aluminum company had a production capacity of 12,000 tons of primary aluminum, with 2,000 employees, and became one of the most important exporters in Switzerland. In 1988, Alusuisse and Lonza owned power stations in Australia, Austria, the Federal Republic of Germany, and Switzerland.

Alusuisse operated plants in the Federal Republic of Germany at Bergheim, Rheinfelden, and Singen, and was associated with Iceland for its supply of metals. In 1987, Alusuisse employed 24,467 workers in its operations worldwide. The company operated a bauxite mine for the production of alumina at Gove in Australia for shipment to its smelters in Switzerland. The operation at Gove dated to about 1970, and, by 1988, about 1.4 million tons of alumina was produced and exported annually, of which about 70% was owned by Alusuisse. About 250,000 tons annually, in excess of the company's requirements, was either sold to third-party customers or was used in barter or telling contracts to cover shortfalls of primary aluminum for their own fabricating plants. Another Alusuisse subsidiary, Sieromco Inc., an

TABLE 5

## SWITZERLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

| Commodity[2] | | 1984 | 1985 | 1986 | 1987[p] | 1988[e] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum, smelter, primary | tons | 79,173 | 72,742 | 80,259 | 73,169 | 75,000 |
| Iron and steel: | | | | | | |
| Pig iron and blast furnace ferroalloys | | 54 | 66 | 79 | 70 | 70 |
| Electric-furnace ferroalloys[e] | | 5 | 5 | 5 | 5 | 5 |
| Steel, crude | | 978 | 987 | 1,075 | 870 | 825 |
| Semimanufactures, rolled products | | 800 | 950 | 980 | [r e]1,000 | 1,100 |
| Lead, refined, secondary | tons | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| INDUSTRIAL MINERALS | | | | | | |
| Cement, hydraulic | | 4,181 | 4,254 | 4,393 | 4,617 | 4,700 |
| Gypsum[e] | | 220 | 220 | 200 | 230 | 230 |
| Lime | | 41 | 37 | 35 | 40 | 42 |
| Nitrogen: N content of ammonia[e] | | 33 | 31 | 30 | 39 | 35 |
| Salt | | 372 | 374 | 389 | 390 | [3]392 |
| Sodium compounds, n.e.s.: Carbonate[e] | tons | 44 | 45 | 43 | 23 | — |
| Sulfur, from petroleum refining | do. | 2,878 | 2,638 | 3,201 | 3,533 | 3,550 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Gas: | | | | | | |
| Manufactured | million cubic feet | 1,098 | 1,154 | 1,162 | [e]1,170 | 1,200 |
| Natural | do. | — | 700 | 600 | 1,100 | 1,300 |
| Petroleum refinery products:[4] | | | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | 1,609 | 1,677 | 1,546 | 1,817 | [3]1,986 |
| Gasoline, all kinds | do. | 8,610 | 8,650 | 8,723 | 8,765 | [3]8,695 |
| Naphtha | do. | 74 | 38 | 31 | 6 | [3]9 |
| Jet fuel | do. | 2,030 | 1,936 | 2,099 | 2,286 | [3]1,949 |
| Kerosene | do. | 26 | 32 | 31 | 30 | [3]19 |
| Distillate fuel oil | do. | 13,095 | 13,450 | 13,521 | 12,863 | [3]11,887 |
| Residual fuel oil | do. | 4,862 | 4,590 | 4,579 | 3,917 | [3]4,322 |
| Bitumen | do. | 839 | 721 | 892 | 931 | [3]904 |
| Other refinery products | do. | — | 2 | 2 | 5 | [3]5 |
| Refinery fuel and losses | do. | 1,221 | 1,191 | 1,291 | 1,311 | [3]1,133 |
| **Total[5]** | **do.** | **32,366** | **32,287** | **32,715** | **31,931** | **30,909** |

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through Apr. 1989.

[2] In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) is produced, but output is not reported, and available general information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Table revised to conform to reporting format in Erdoel-Vereinigun/Union Petroliere, Zurich, Annual Yearbook.

[5] Total of listed products only.

ore and metal company in Sierra Leone, employed about 800 workers. The company mined and shipped about 1.4 million tons of washed bauxite, primarily to Lonza's Martinwerk. A contract covering the subsidiary's mining operation was extended in 1987 for another 10 years and was ratified by Sierra Leone's Parliament in 1988. The proven reserves were estimated at a million tons of bauxite, and another 10 to 15 million tons of bauxite were delineated as possible resources. Lonza Inc., which operated since 1969, has many locations in the United States and employed about 1,500 workers.

Metallwerke Refonda AG, established in 1939, was the only recycling plant in Switzerland. Alusuisse bought the company in 1975. It processed about 30,000 tons of aluminum scrap annually into 27,000 tons of casting alloy ingots. Refonda employed about 140 people in administration, production, and sales.

**Iron and Steel.**—All of the country's needs for iron ore and concentrates for the production of pig iron and scrap for the production of crude steel were met by imports. The largest Swiss steel and engineering company, Von Roll Ltd., at Gerlafinger in the northwestern canton of Solothurn, increased its total trade turnover by 45% to $1.3 billion, largely because of the acquisition of cable producer Isola Ltd. New orders rose 25%, and the company expected to double profits, with steel production representing about 35% of its income. The company's two plants, operating at Gerlafinger and Monteforno, planned to reduce their combined capacities by 100,000 tons per year. Von Roll's subsidiary in the United States, the minimill New Jersey Steel Inc., installed a new mill, manufactured in the Federal Republic of Germany, to raise capacity to 410,000 tons per year. To strengthen its position in the Federal Republic of Germany and the EC, Von Roll purchased Dielektra GmbH, an electronics group in Cologne, the Federal Republic of Germany. Dielektra employed 470 people. Von Roll also manufactured products in France, Italy, and Spain and distributed them through subsidiaries in Belgium, the Federal Republic of Germany, and the United Kingdom. The company also had a sales office in Hong Kong for distribution in the Far East.

Von Mosse Stahl AG, the second largest steel company in Switzerland, diversified out of steel. The company, based in Lucerne, restructured its 300,000 tons per year capacity steel operation into a separate division. The company's subsidiary, Pantex Stahl AG, began work on the reinforcement mesh system for tunnel construction and with channel tunnel contractors from Japan, the United Kingdom, and the United States. The company acquired a minority stake in a Connecticut steel company and planned to acquire new technology and access to North American markets.

Switzerland's minimill, Ferrowohlen AG, was established in 1955 to produce about 150,000 tons per year of rod and bar. No steel slabs were produced in Switzerland. There was speculation that Ferrowohlen was installing a hot strip mill at its plant in Wohlen in 1988, thus making its debut in wide hot coil production.[19]

Pestalozzi & Co. celebrated its 200th anniversary in the metals industry. The company, which began as a small iron and steel distribution business in Zurich, by 1988 employed more than 500 workers. The company continued to be family-owned. About 50% of the turnover came from steel, 25% from tools and machines, and 25% from plastic products and plumbing materials.[20]

***Industrial Minerals.***—Except for exploration for precious metals and stones and small extraction of natural gas, mining was limited to industrial minerals, such as construction materials, gypsum, and salt. However, none were produced in appreciable quantities. Most industrial minerals, especially cement, recorded a continuous but gradual growth. The production of sodium carbonate, which was halved in 1987, ceased completely in 1988.

In general, producers of calcium carbonate in Europe had their production operations in their country of origin. There were, however, two major exceptions, the Omya Group of companies, owned by Pluess-Stauffer AG of Switzerland, and ECC Calcium Carbonates Ltd., part of English China Clays Group. Both were active internationally. Omya had operations in Austria, France, the Federal Republic of Germany, Portugal, Spain, and the United Kingdom. Omya has long been regarded as one of the pioneers of ultrafine grinding of calcium carbonate and is one of the largest producers of calcium carbonate filiers in the world. In Finland, Oy Forby AB was a joint venture between Omya's Pluess-Stauffer and Karl Forsstrom AB, which began in 1981. Omya's Finnish partner mined the limestone underground at its Forby operations.[21]

***Mineral Fuels.***—In Switzerland, 61.8% of the electrical energy was generated by hydropower. Alusuisse/Lonza contributed a portion of its electrical energy overflow to the network. Switzerland continued to be a net exporter of electricity and increased its net exports by 14%, although imports from France remained considerable during the winter. Nuclear energy was produced by five nuclear power stations, generating about 36.5% of the total electrical output. In September 1988, the Parliament proposed to abandon the Kaiseraugust nuclear power project. It seemed unlikely that any nuclear power station will be built in Switzerland in the next decade. The burning of coal and hydrocarbons, such as crude oil and natural gas, was discouraged.

Switzerland imported all of its oil requirements. Approximately two-thirds of imports were oil products, of which 84% came from the EC. The major share of crude oil was imported from Libya and

amounted to 45% of the total; Norway and the United Kingdom provided 16%. Exploration activities were restructured for the third exploration program covering the period 1988–92.

Gas consumption increased in 1988. Most gas needs were imported from the Netherlands and the Norwegian sectors of the North Sea through supply companies in the Federal Republic of Germany. Gas imports from the U.S.S.R. provided about 16% of the demand.

Solid fuels consumption continued to decrease. Coal, which was entirely imported, accounted for one-third of solid fuels and was mainly used in the industrial minerals industry. Two-thirds of solid fuels were domestic wood, which was used basically for residential heating.

## MALTA[22]

Mineral production on the island country of Malta consisted of lime, limestone, and salt. The demand for all other fuels, metals, and industrial minerals was met by imports. Malta acquired a portion of its export earnings by serving as a bunkering and transshipment point for petroleum and refinery products.

In 1988, Malta was into its second year of rule under the Government of the Christian Democratic Party, which defeated the labor-oriented Nationalist Party in elections held in May 1987. At the end of the Nationalist Party's 16-year rule, almost one-half of Malta's work force was employed by the state sector, which generated about 40% of the GNP. The new Government was engaged in a gradual program to diminish the role of the state sector proportional to the private sector in the economy.

The new Government is also committed to obtaining full membership for Malta in the EC. Malta was already an associate member of the EC. The Government was preparing to submit a formal application for full membership to the EC before the end of its present term of office in 1992.

Along with seeking full membership in the EC, the Government of the Christian Democratic Party had undertaken initiatives to promote manufacturing, shipping, the service industries, and tourism. In conjunction with these initiatives, legislation was passed that provided a framework for increased investment in manufacturing, the development of a major offshore business center, and the creation of a free port at the Marsaxlokk development.

To promote manufacturing, the Industrial Development Act was passed in June; it offered major incentives to foreign investors. The Government was particularly desirous of promoting high-tech industries including electronics, automotive components, light engineering, chemicals, plastics, computers, and telecommunications.

To further industrial development, the Malta Development Corp. was formed. It was a Government agency run by local industries with the purpose of promoting industry and serving as a liaison for industry with the Government. To support industrial development, a large program was under way to upgrade the country's infrastructure. The program included installing state-of-the-art telecommunications, investing in a new powerplant, laying roads, improving the water supply, and constructing a new terminal at the Luqa Airport.

The program for creating a free port at Marsaxlokk, when accomplished, would enhance Malta's attraction as a transshipment hub in the Mediterranean. To meet additional transshipment demand at Marsaxlokk, construction had begun of an oil products terminal with an initial capacity of 200,000 cubic meters.

In 1988, Malta resumed its program to promote offshore oil development. In March, the Government of Malta invited international oil drilling companies to submit proposals for concessionary oil exploration in 2 blocks of the Area 3 zone covering a total of 15,200 square kilometers. This area borders Italy's large Vega oilfield in the Mediterranean. The deadline for submission of tenders was July.

Malta's offshore exploration activities suffered a major setback in 1980 as a result of a boundary dispute with Libya concerning the median line for offshore development. The dispute was resolved in 1986 following a ruling in 1985 by the International Court of Justice. However, the area where the Government was now

TABLE 6

**MALTA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]**

| Commodity | | 1984[2] | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|
| Lime | cubic meters | 5,474 | 5,500 | 5,500 | 5,500 | 5,500 |
| Limestone | thousand cubic meters | 652 | 700 | 650 | 600 | 600 |
| Salt | metric tons | 92 | 100 | 100 | 100 | 100 |

[1] Table includes data available through June 30, 1989.
[2] Reported figure.

TABLE 7

## MALTA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Destinations, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS | | | | | |
| Aluminum: Metal including alloys: | | | | | |
| Scrap | | 293 | 835 | — | Italy 817; Netherlands 16; United Kingdom 2. |
| Unwrought | value, thousands | — | $290 | — | All to Italy. |
| Semimanufactures | do. | $1,659 | $5,463 | — | Italy $5,347; West Germany $100. |
| Copper: Metal including alloys: | | | | | |
| Scrap | | 170 | 360 | — | Italy 269; Republic of Korea 38; West Germany 37. |
| Semimanufactures | value, thousands | $2 | — | | |
| Iron and steel: Metal: | | | | | |
| Scrap | | 5,427 | 10,566 | — | Italy 10,132; United Kingdom 249; Denmark 89. |
| Steel, primary forms | | 2 | — | | |
| Semimanufactures: | | | | | |
| Wire | value, thousands | $16 | $17 | — | Ireland $13; United Kingdom $4. |
| Tubes, pipes, fittings | do. | $83 | — | | |
| Casting and forgings, rough | do. | $745 | $371 | — | Belgium-Luxembourg $265; U.S.S.R. $76; Algeria $30. |
| Lead: Metal including alloys, scrap | do. | $82 | $81 | — | Italy $38; United Kingdom $27; Netherlands $10. |
| Nickel: Metal including alloys: | | | | | |
| Scrap | | 7 | 4 | — | West Germany 2; United Kingdom 2. |
| Semimanufactures | value, thousands | $2 | — | | |
| Tin: Metal including alloys: | | | | | |
| Scrap | do. | — | $3 | — | All to Italy. |
| Semimanufactures | do. | $1 | — | | |
| Zinc: Metal including alloys: | | | | | |
| Scrap | | 61 | 29 | — | All to United Kingdom. |
| Semimanufactures | | (2) | — | | |
| Other: Ashes and residues | value, thousands | $6 | $8 | — | All to West Germany. |
| INDUSTRIAL MINERALS | | | | | |
| Abrasives, n.e.s.: Grinding and polishing wheels and stones | value, thousands | $696 | $905 | — | Australia $336; West Germany $274; Yugoslavia $128. |
| Diamond: Gem, not set or strung | do. | $3,392 | $3,580 | — | All to Belgium-Luxembourg. |
| Fertilizer materials: Crude, n.e.s. | do. | $17 | $18 | — | All to Italy. |
| Stone, sand and gravel: Dimension stone: | | | | | |
| Crude and partly worked | do. | $14 | — | | |
| Worked | do. | $9 | $35 | — | France $20; United Kingdom $11; Italy $3. |
| MINERALS FUELS AND RELATED MATERIALS | | | | | |
| Petroleum refinery products: | | | | | |
| Lubricants | value, thousands | $4 | $3 | — | All to United Kingdom. |
| Bitumen and other residues | 42-gallon barrels | 88 | 6,060 | — | All to Italy. |

[1] Table prepared by staff, Branch of Geographic Data.
[2] Less than 1/2 unit.

TABLE 8

## MALTA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS | | | | | |
| Aluminum: | | | | | |
| Oxides and hydroxides | value, thousands | $19 | $49 | — | Ireland $34; France $9. |
| Metal including alloys: | | | | | |
| Scrap | | 1 | 101 | — | All from Yugoslavia. |
| Unwrought | value, thousands | $521 | $1,078 | $157 | Italy $503; France $272. |
| Semimanufactures | do. | $7,487 | $10,875 | $85 | Italy $6,920; West Germany $1,607; Netherlands $983. |
| Arsenic: Metal including alloys, all forms | do. | $1 | — | | |
| Chromium: Oxides and hydroxides | do. | $16 | $7 | — | United Kingdom $6; West Germany $1. |
| Copper: Metal including alloys: | | | | | |
| Unwrought | do. | $116 | $20 | — | All from Italy. |
| Semimanufactures | do. | $1,478 | $1,870 | $23 | United Kingdom $1,036; France $286; West Germany $228. |
| Iron and steel: | | | | | |
| Iron ore and concentrate: Pyrite, roasted | do. | $2 | $2 | — | All from Yugoslavia. |
| Metal: | | | | | |
| Scrap | | 529 | 329 | 20 | Netherlands 176; United Kingdom 102. |
| Pig iron, cast iron, related materials | do. | $486 | $305 | — | Greece $179; Czechoslovakia $45; United Kingdom $39. |
| Ferroalloys: | | | | | |
| Ferromanganese | do. | $1 | $3 | — | All from United Kingdom. |
| Unspecified | do. | $41 | — | | |
| Steel, primary forms | do. | $1,618 | $1,223 | — | Greece $539; Spain $233; Turkey $224. |
| Semimanufactures: | | | | | |
| Bars, rods, angles, shapes, sections | do. | $7,131 | $4,478 | $1 | United Kingdom $1,957; Italy $741; Belgium-Luxembourg $688. |
| Universals, plates, sheets | do. | $7,988 | $7,686 | — | West Germany $1,849; Czechoslovakia $1,711; Belgium-Luxembourg $1,091. |
| Hoop and strip | do. | $235 | $182 | — | Italy $96; West Germany $75. |
| Rails and accessories | do. | $8 | $13 | — | United Kingdom $8; Netherlands $5. |
| Wire | do. | $998 | $1,580 | — | Italy $648; United Kingdom $381; Poland $148. |
| Tubes, pipes, fittings | do. | $5,204 | $4,596 | $2 | West Germany $1,034; United Kingdom $906; Italy $775. |
| Castings and forgings, rough | do. | (2) | $103 | — | Hong Kong $29; Czechoslovakia $23; Poland $22. |
| Lead: | | | | | |
| Oxides | do. | $60 | $137 | — | United Kingdom $94; West Germany $42; Italy $1. |

See footnotes at end of table.

TABLE 8—Continued

## MALTA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Lead—Continued | | | | | |
| Metal including alloys: | | | | | |
| Unwrought | value, thousands | $123 | $144 | — | United Kingdom $132; Belgium-Luxembourg $11. |
| Semimanufactures | do. | $27 | $72 | $1 | United Kingdom $44; Belgium-Luxembourg $22. |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | (2) | — | | |
| Unwrought | | (2) | — | | |
| Semimanufactures | value, thousands | $2 | $3 | — | All from West Germany. |
| Manganese: Oxides | do. | $2 | — | | |
| Mercury | do. | (2) | $1 | — | NA. |
| Nickel: Metal including alloys: | | | | | |
| Unwrought | do. | $14 | $104 | — | United Kingdom $103; West Germany $1. |
| Semimanufactures | do. | $246 | $509 | — | United Kingdom $270; West Germany $143; Ireland $73. |
| Platinum-group metals: Metals including alloys, unwrought and partly wrought | do. | (2) | — | | |
| Silver: | | | | | |
| Waste and sweepings | do. | $2 | — | | |
| Metal including alloys, unwrought and partly wrought | do. | $179 | $197 | — | United Kingdom $121; West Germany $59; Italy $10. |
| Tin: Metal including alloys: | | | | | |
| Unwrought | do. | $9 | $1 | — | All from United Kingdom. |
| Semimanufactures | do. | $1,300 | $864 | — | Italy $519; United Kingdom $260; France $36. |
| Titanium: Oxides | do. | $521 | $666 | $253 | United Kingdom $243; West Germany $157. |
| Tungsten: Metal including alloys, all forms | do. | — | $27 | — | All from United Kingdom. |
| Uranium and/or thorium: Metal including alloys, all forms | do. | — | $1 | — | All from West Germany. |
| Zinc: | | | | | |
| Oxides | do. | $45 | $59 | — | Netherlands $35; Norway $11; West Germany $5. |
| Metal including alloys: | | | | | |
| Scrap | | 1 | 29 | — | All from Italy. |
| Unwrought | value, thousands | $132 | $105 | — | United Kingdom $48; France $38; Belgium-Luxembourg $15. |
| Semimanufactures | do. | $84 | $104 | — | Belgium-Luxembourg $46; Italy $23; United Kingdom $11. |
| Other: | | | | | |
| Ores and concentrates | do. | — | $1 | — | All from Yugoslavia. |
| Base metals including alloys, all forms | do. | $2 | $11 | — | All from Italy. |

See footnotes at end of table.

TABLE 8—Continued

## MALTA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS | | | | | |
| Abrasives, n.e.s.: | | | | | |
| Natural: Corundum, emery, pumice, etc | value, thousands | $96 | $263 | — | Italy $122; Greece $81; Turkey $37. |
| Artificial: Corundum | do. | $28 | $45 | — | Yugoslavia $44; West Germany $1. |
| Dust and powder of precious and semiprecious stones including diamond | do. | $13 | $12 | — | Belgium-Luxembourg $9; Ghana $3. |
| Grinding and polishing wheels and stones | do. | $531 | $803 | $2 | Italy $323; Yugoslavia $220; West Germany $89. |
| Barite and witherite | do. | $59 | $4 | — | West Germany $2; United Kingdom $2. |
| Boron materials: | | | | | |
| Crude natural borates | do. | (2) | — | | |
| Oxides and acids | do. | $3 | $2 | — | West Germany $1; Italy $1. |
| Cement | | 162,840 | 158,984 | — | U.S.S.R. 83,891; Bulgaria 41,911; Tunisia 11,234. |
| Chalk | value, thousands | $56 | $90 | — | United Kingdom $42; France $16; Italy $12. |
| Clays, crude | | 406 | 567 | — | United Kingdom 281; Italy 265; West Germany 14. |
| Cryolite and chiolite | value, thousands | $2 | $9 | — | All from Yugoslavia. |
| Diamond: | | | | | |
| Gem, not set or strung | do. | $4,242 | $3,429 | — | Ghana $1,899; Angola $624; Switzerland $521. |
| Industrial stones | do. | $331 | $7 | — | Belgium-Luxembourg $5; Ghana $2. |
| Diatomite and other infusorial earth | do. | $32 | $65 | — | West Germany $28; Italy $26; France $5. |
| Feldspar, fluorspar, related materials: | | | | | |
| Fluorspar | do. | (2) | — | | |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 2,907 | — | | |
| Manufactured: | | | | | |
| Ammonia | value, thousands | $20 | $20 | — | United Kingdom $10; France $7. |
| Nitrogenous | | 2,032 | 2,199 | — | Italy 2,086; West Germany 100. |
| Phosphatic | value, thousands | $5 | $5 | — | Netherlands $3; Belgium-Luxembourg $1. |
| Potassic | do. | — | $3 | — | All from Netherlands. |
| Unspecified and mixed | | 415 | 333 | — | Belgium-Luxembourg 228; West Germany 49; United Kingdom 35. |
| Graphite, natural | | (2) | — | | |
| Gypsum and plaster | value, thousands | $38 | $45 | — | Spain $28; West Germany $9; United Kingdom $7. |
| Lime | do. | $1 | $46 | — | United Kingdom $36; Italy $10. |
| Magnesium compounds | do. | $1 | $1 | — | All from United Kingdom. |
| Mica: | | | | | |
| Crude including splittings and waste | do. | $9 | $27 | — | United Kingdom $25; Italy $2. |

See footnotes at end of table.

TABLE 8—Continued

## MALTA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Mica—Continued | | | | | |
| Worked including agglomerated splittings | value, thousands | $1 | — | | |
| Pigments, mineral: | | | | | |
| Natural, crude | do. | $11 | $6 | — | All from United Kingdom. |
| Iron oxides and hydroxides, processed | do. | $26 | $22 | — | West Germany $9; United Kingdom $7; Italy $4. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | do. | $8 | $13 | $3 | Austria $2; West Germany $1. |
| Synthetic | do. | $3 | $8 | $2 | West Germany $5; Austria $1. |
| Pyrite, unroasted | | — | 7 | — | All from Yugoslavia. |
| Salt and brine | value, thousands | $277 | $100 | — | United Kingdom $93; West Germany $4; Italy $2. |
| Sodium compounds, n.e.s.: Carbonate, manufactured | | 140 | 78 | — | Bulgaria 60; West Germany 18. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | value, thousands | $1,914 | $2,589 | — | Italy $2,565; Portugal $24. |
| Worked | do. | $28 | $30 | — | Italy $28; West Germany $1; United Kingdom $1. |
| Dolomite, chiefly refractory-grade | do. | — | $1 | — | All from Norway. |
| Gravel and crushed rock | do. | $828 | $828 | $2 | Italy $811; Belgium-Luxembourg $7. |
| Quartz and quartzite | do. | $21 | $8 | — | Belgium-Luxembourg $7; United Kingdom $1. |
| Sand other than metal-bearing | do. | $149 | $77 | — | United Kingdom $38; Italy $28; Belgium-Luxembourg $10. |
| Sulfur: | | | | | |
| Elemental: Colloidal, precipitated, sublimed | | 93 | 81 | — | Italy 80; United Kingdom 1. |
| Dioxide | value, thousands | $4 | — | | |
| Sulfuric acid | do. | $114 | $82 | — | Netherlands $41; United Kingdom $34; Italy $7. |
| Talc, steatite, soapstone, pyrophyllite | do. | $61 | $87 | — | Italy $51; Norway $19; United Kingdom $8. |
| Other: | | | | | |
| Crude | do. | $6 | $8 | — | United Kingdom $4; Netherlands $3; Austria $1. |
| Slag and dross, not metal-bearing | do. | — | $8 | — | All from Greece. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 2 | 501 | 1 | Austria 500. |
| Carbon: | | | | | |
| Carbon black | value, thousands | $286 | $299 | $12 | Italy $117; West Germany $98; Canada $69. |
| Gas carbon | do. | $9 | — | | |

See footnotes at end of table.

TABLE 8—Continued

## MALTA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1986 | 1987 | Sources, 1987 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Coal: | | | | | |
| Anthracite and bituminous | value, thousands | $6,554 | $5,701 | — | United Kingdom $3,216; Spain $2,485. |
| Briquets of anthracite and bituminous coal | do. | $11 | $16 | — | Australia $11; United Kingdom $5. |
| Lignite including briquets | do. | $1 | — | | |
| Coke and semicoke | do. | $8 | $11 | — | United Kingdom $7; Italy $4. |
| Peat including briquets and litter | do. | $70 | $125 | — | Netherlands $44; United Kingdom $43; Ireland $31. |
| Petroleum refinery products: | | | | | |
| Mineral jelly and wax | do. | $380 | $448 | — | Hungary $200; Italy $127; United Kingdom $71. |
| Lubricants | do. | $3,171 | $3,207 | $65 | Belgium-Luxembourg $1,008; Italy $914; United Kingdom $881. |
| Bitumen and other residues | 42-gallon barrels | 38,872 | 34,542 | 6 | Austria 34,518; Denmark 12; United Kingdom 6. |
| Bituminous mixtures | value, thousands | $240 | $413 | — | Austria $284; United Kingdom $68; France $49. |

NA Not available.
[1] Table prepared by staff, Branch of Geographic Data.
[2] Less than 1/2 unit.

promoting exploration, was not part of the disputed area.

[1] Prepared by John G. Panulas, physical scientist, Division of International Minerals.

[2] Where necessary, values have been converted from Italian lira to U.S. dollars at the rate of Lit1350 = US$1.00, the average rate in 1988.

[3] Prepared by George A. Rabchevsky, physical scientist, Division of International Minerals.

[4] Values have been converted from Austrian Schillings (S) to U.S. dollars at the rate of S12.30 = US$1.00, the average rate in 1988.

[5] Financial Times (London). May 16, 1989, Section III, pp. I–IV.

[6] Mining Magazine (London). Dec. 1988, p. 513.

[7] Mining Journal (London). July 14, 1989, p. 22.

[8] Metal Bulletin (London). Oct. 27, 1988, p. 25.

[9] Journal of Commerce (London). Oct. 17, 1988, pp. 8A–9A.

[10] Comecon is an organization of 10 countries whose economies are centrally planned. Comecon aims for economic cooperation and coordination among the following member countries: Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the U.S.S.R., and Vietnam. Yugoslavia has permanent observer status.

[11] Industrial Minerals (London). Dec. 1988, p. 37.

[12] ———. Jan. 1989, p. 27.

[13] Gluckauf (Essen). V. 124, No. 7, 1988, p. 216.

[14] Petroleum Economist (London). Sept. 1988, p. 306.

[15] Prepared by George A. Rabchevsky, physical scientist, Division of International Minerals.

[16] Muncey, S. A Swiss Specialty. Countertrade & Barter (London), Aug.-Sept. 1988, pp. 15–20.

[17] Where necessary, values have been converted from Swiss francs (SwF) to U.S. dollars at the rate of SwF1.45 = US$1.00, the average in 1988.

[18] The Sun (Zurich). Internal Alusuisse Group Periodical. Alusuisse—Our Future Began 100 Years Ago. (Zurich). No. 21, Nov. 1988.

[19] Metal Bulletin (London). May 12, 1988, p. 29.

[20] ———. Nov. 1988, p. 63.

[21] Dickson T. White Carbonate Fillers. An Ocean of Difference. Ind. Miner. (London), Aug. 1987, p. 73.

[22] Prepared by Richard M. Levine, foreign mineral specialist, Division of International Minerals.